

May 3, 1930

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AVIATION

The Oldest American Aeronautical Magazine



THE *New York* SHOW

State Control IN CONNECTICUT

Capital Investment IN THE INDUSTRY



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62%
Lighter than Iron



Why . . . do 95% of America's airplane engine builders recommend Gargoyle Aero Oils and Mobilgrease? Because

careful service tests have proved to their satisfaction that these lubricants insure greater operating efficiency in the motors they build.

Because . . . "Double Range" Mobiloil Aero Oils make possible—

1. Instant oil distribution—less time in warming up.
2. More miles per gallon of oil.
3. Increased gasoline and oil mileage.
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Because

Mobilgrease, for rocker-arm lubrication, lasts longer, adheres better to frictional surfaces and is more economical than any other lubricant offered for this purpose . . . The full line of Gargoyle Aero Oils and Lubricants are on sale at established airports throughout the world.

VACUUM OIL COMPANY • Makers of high quality lubricants for all types of machinery



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AERO OILS

FOR ROCKER-ARM LUBRICATION USE MOBILGREASE

FIRE — AN INCIDENT OR A DISASTER ?



Sooner or later FIRE comes— Stop him!

You can't reason with Fire. And it's futile to say "We're careful here; we won't have a fire." For an airport with its crowded planes and inflammable oils and fuels offers a tempting prey for Fire to step on. Some day some one will be careless! Some day something will go wrong! An emergency will be upon you. Will it be an incident or a disaster?

An incident if you are ready with the proper fire extinguishing equipment! We offer you a service that eliminates guesswork. It provides for a detailed study of the fire hazards of your airport, installation of correct types and sizes of fire-fighting equipment, instruction in proper charging and maintenance of equipment, advice on where and how to locate it, in-

struction of your employees in the proper use of this equipment. If you want regular inspection and maintenance service by our engineers—a service that insures the efficient operation of your equipment at all times.

An interview with one of our fire protection engineers carries no obligation. We write for "Smother Firemen" a booklet describing airport hazards and how to protect them. American La France and Foamite Corporation, Dept. T&L, Emden, N. Y. Offices located Principal Cities.

LA FRANCE AND FOAMITE PROTECTION
AN ENGINEERING SERVICE
AGAINST FIRE



AVIATION
May 8, 1930

AVIATION
May 8, 1930

Reliability and Light Weight Distinguish GENERAL ELECTRIC EQUIPMENT



The generating unit in the heart of the magnet compass



A card compass provides accurate indication in any tilt, such as the pilot is in flight



The compass indicator is built in accordance with the standard



The compass controller matches the pilot's compass directional control



GE IS IN THE GENERAL PURPOSE SPOT
BROADCAST EVERY SATURDAY EVENING,
ON A NATION-WIDE RADIO NETWORK

THE MAGNETO COMPASS combines reliability and light weight to a degree never before attained in an aircraft instrument of this character. For example, in the generating unit there are no universal joints; a damped pendulum system maintains proper relation with the earth's magnetic field and provides

exceptional stability. Furthermore, directional indications depend upon the position of pole pieces—not the position of the brushes. The weight of the generating unit complete with wind-driven impeller is 5.6 lb. The accessories add about 6 lb.

THE CARD COMPASS admirably serves the need for an accurate assessment of moderate cost. A special vibration-absorbing bracket permits base, ceiling, wall, or panel mounting. Other features include: non-glare lighting; ground-glass lens; luminous dial and lubber line, and adjustable compensations. The weight complete is 1.9 lb.



THE ENGINE TEMPERATURE INDICATOR enables the pilot to read engine temperature direct—regardless of the temperature of the oil supply or cooling liquid. It is accurate and reliable, it requires no battery, it is not connected with the ignition system. The weight complete is 1.2 lb.

THE OIL IMMERSION HEATER should be a part of the equipment of every engine. It is suitable for connection to any standard electric-lighting circuit. Placed in the oil sump of an engine, it heats the oil properly and facilitates a safe, quick start.







RECENT General Electric developments also include built-in, wing-type landing lights and radio-shielding ignition harnesses. For complete information, address the General

Electric Company, Schenectady, N. Y.—manufacturer of lighting equipment, instruments for navigation and flight, engine accessories, and sundry devices for the aeronautic industry.

GENERAL ELECTRIC

NO OTHER PART OF AN AIRPLANE IS MORE PRECISION-BUILT

	<p>THE cylinders of Aerol Military Struts are machined in one place from a single chrome-nickel-steel extruded or tube forging specially heat-treated in modern electric furnaces under promoter control. The possibility of flaws in the metal or errors in heat-treating are eliminated.</p>		<p>THE finished cylinder is exactly machine-bored to rigid limits. One one-thousandths of one inch is the maximum tolerance allowed and rigid inspection prevents the passing of any cylinders not meeting these requirements.</p>
<p>THE piston assembly also represents the highest quality of materials and workmanship. The piston is made from special chrome-nickel-steel extruded or tube forging and the carefully fitted head is of shock-resisting gas metal. The special packing holds a perfect seal throughout years of active service.</p>		<p>THE finished strut combines fine materials, workmanship and superior design. No other type of landing-shock absorber can equal the operating efficiency and long life of these struts. That is why there are more Aerol Struts in use today than any other make.</p>	

BUILT BY THE CLEVELAND PNEUMATIC TOOL CO., CLEVELAND

AEROL shock absorbing STRUT

AMERICA'S BEST BUILDERS OF LIGHT PLANES FURNISH WARNER POWERED PLANES



Warner's wonderfully efficient design, Warner precision manufacturing and Warner performance have won a place for themselves to the point where the foremost builders of light airplanes in this country furnish planes Warner-equipped.

These men whose very business stability is based on their knowledge of the performance characteristics of every engine in their power class have placed their unconditional stamp of approval on the Warner engine.

The holder of many of the most coveted records, including both the world's Speed and American Absolute records for light planes, Warner engines have set a stiff pace for others to follow.

The new Warner service program insures too that every owner of a Warner-equipped plane, will get the very best kind of service that the entire industry affords.

We would like to give you detailed information on both the 5 and 7 Cylinder Models. Write for it.

WARNER AIRCRAFT CORPORATION
DETROIT MICHIGAN

WARNER Scarab ENGINES

AIR TRAFFIC AND PROFITS WING THEIR WAY TO PORTS WITH PAVED SURFACES

No other single thing can contribute so much to the prosperity and popularity of your airport as paved runways and landing strips. No other thing can do so much to put it upon a busy, money-making basis.

Pilots will fly miles farther to land and take off in safety on a smooth, skidproof surface. Transport and mail lines will give first choice to a port that keeps service up all year 'round, regardless of bad weather.

You can pave your airport surfaces at moderate cost, if you use Tarmac. Let us send you information on its use, and what it will cost. Write to the Pittsburgh office and if you wish, send a sketch of your field in-out.

AMERICAN TAR PRODUCTS COMPANY
Division of The Koppers Company
General Office: PITTSBURGH, Pa.
New England District: Tar Products Corporation, Providence, R. I.

Surface

RUNWAYS
PARKING AREAS
HANGAR-APRONS
CONNECTING ROADS
TAXI STRIPS

at moderate cost

with

Tarmac

WATER WINGED

Equipped with floats, The FLEET may be flown wherever there is water. Freedom from landing field restrictions the advantage of dropping down on any river or sheet



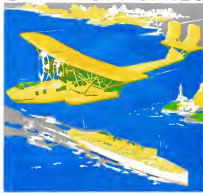
of water—always nearer a city's center than a landing field—is now the privilege of flyers of The FLEET Seaplane. With the same marvelous maneuverability, ease of control and low air-maintenance cost which have made The FLEET Landplane the standard for training through-

out the Western Hemisphere—The Fleet Seaplane has a wider range of operation . . . and to sportsmen flyers adds a greater thrill. You will be interested in knowing more about The FLEET Seaplane. A request by mail will bring you full information.

FLEET AIRCRAFT, INC.
BUFFALO NEW YORK

THE FLEET





CONSOLIDATED AIRCRAFT CORPORATION, BUFFALO, N. Y.



A GOOD hull does not make an amphibian, nor two wheels a landing gear. Between the wheels and your five or fifty thousand dollar plane must be a shock unit to counteract landing impact and vibration. Upon the selection of this unit and its adaptability to your landing gear design depends the satisfaction of your customer.

Gruss struts are cushioning the load of America's largest load plane, without rebound. Gruss struts, in smaller sizes, are eliminating landing hazard on hundreds of spot planes. Now, for the amphibious retractable landing gear of conventional or unique designs, Gruss adapts their standard struts, guaranteeing you and your customer complete operating satisfaction.

When your amphibious comes down to earth on Gruns the smooth, yet lightning like, action of Gruns struts will absorb the landing impact instantly, without rebound.

A Grass strut has been engineered for every type of land plane and amphibian. We invite you to submit your shock absorber requirements to us.

**Gross Air Spring Company
of America, Ltd.**

40240, Blakely Blvd., Concord 94601, Clairton
Los Angeles, California



WITHOUT REBOUND



Giant Fokker F-3, equipped with Western Electric Airplane Telephone



Western Air Express the pioneer calls at will with their pilots on route

Western Air Express installs the Airplane Telephone

WESTERN ELECTRIC radio telephone equipment helps Western Air Express to make its service efficient by keeping pilots and ground personnel constantly in touch.

Western Air Express operates fifteen radio telephone stations for transmitting weather and landing information to pilots, and plans to equip seven more. Twenty-nine Western Air Express planes carry short wave sending and receiving equipment for 2-way telephone communication with company owned ground stations as well as long

wave receivers which bring in radio beacon signals and government weather reports.

Western Electric equipment is light, compact, accessible, easily installed and arranged for remote control. It was selected by Western Air Express and other leading air lines because it has proved thoroughly dependable under all flying conditions.

For full information about radio telephone equipment for planes or ground stations, write to Western Electric Company, Dept. 247A, 195 Broadway, New York, N. Y.

See the Western Electric exhibit at the New York Show

Western Electric

Aviation Communication Systems



MADE IN THE
FACTORY OF
NEW
TELEPHONES



No oil can lubricate if it isn't where it ought to be—
That's why good operators insist on

PENNZOIL

"THE BEST MOTOR OIL IN THE WORLD"

All's well with the motor—it's alive in every part—it's feeling fit in every fibre—if Pennzoil is the lubricant you are using. Why? Because Pennzoil penetrates. Its rich, protective film spreads like magic to the most remote part of the motor, till every moving surface, every vital point of wear is thoroughly lubricated. Its action is like that of blood in a healthy body. The difference it makes to your motor is exactly the difference you feel between a poor circulation and a good one!

And Pennzoil not only means better, more scientific lubrication—it not only means a higher factor of safety—it means greater economy, too!

It lasts twice as long as ordinary oils, and protects you against high repair costs and worn-out motors. And it is always uniform in quality—made from 100%

pure Pennsylvania crude and nothing else—refined only by the famous Pennzoil process in the refineries of the Pennzoil Company, largest organization in the world operating exclusively on Pennsylvania crudes.

Start using Pennzoil now—and follow the examples of America's great passenger lines, who specify Pennzoil for every plane!

THE PENNZOIL COMPANY

Executive Offices and Refinery: Oil City, Pa.
District Offices: New York, Chicago, Los Angeles

PENNZOIL

HIGHEST QUALITY PENNSYLVANIA OIL

Curtiss-Wright Flying Service announces the opening of *Oklahoma City's Model Airport*



New Curtiss-Wright Airport, 100,000 square ft. at Oklahoma City

Curtiss-Wright Flying Service invites members of the aeronautical industry and the flying public to inspect and utilize the services of Oklahoma City's Model Airport.

B. S. GRAHAM



Royer B. S. Graham, General Manager of Curtiss-Wright
1700,000 Oklahoma City Airport

Oklahoma City's Model Airport, newly opened by Curtiss-Wright Flying Service, takes rank among the country's leading flying fields and service centers.

The field, which covers one hundred and sixty acres and is free of hazards, is located eight miles north of Oklahoma City on K. C. Dallas highway. Transportation to the city is afforded over aerial highway.

Among the airport's features is a new, completely modern Curtiss-Wright hangar, with attractive offices, pilot's lounge, modern lounge, dining room and shops.

Ideal climate, the well-known hospitality of Oklahoma City and fine facilities combine to make Oklahoma City's Model Airport exceptionally popular with modern pilots and mechanics.

Services

Sale of Curtiss-Wright ships and engines.
Service and repair of ships and engines.
Pleasure and test flying.
Flying and mechanical instructions.



Phillips '77' Aviation Gasoline used exclusively at new airport

In keeping with the high standards of service rendered by the Curtiss-Wright Flying Service, Phillips '77' Aviation Gasoline has been selected for exclusive sale and use at Oklahoma City's Model Airport.



Phillips rapid service truck delivering Phillips '77' Aviation Gasoline

THE DEPENDABILITY OF ADVERTISED PRODUCTS



ONLY dependable advertised products are offered to customers by the General Electric Supply Corporation.

The names are familiar throughout the industrial world—General Electric Edison Mazda lamps, Tru-ball switches, Ionance, Curtis X-Ray and Holograph lighting equipment and many others... and all standard General Electric apparatus and supplies, of course.

You have confidence in these dependable names. You know that the manufacturers are alert, responsible and progressive... that they are proud of their products and will-

ing to stand back of them. You know that the products themselves give long, economical, trouble-free service.

Important to you also is the assurance that you can depend on prompt delivery of these materials and supplies. Your plant is within a few hours—or minutes—of adequate stocks, maintained at more than 80 different points throughout the United States. Special delivery service from the house nearest you enables you to secure supplies and materials exactly when you want them. When you have an electrical need—write!



... to serve better the electrical needs of America

Join us in the General Electric Hour, broadcast every Sunday evening over a nation-wide N. B. C. network.

GENERAL ELECTRIC SUPPLY CORPORATION

GENERAL OFFICES

BRIDGEPORT, CONNECTICUT

SAFETYCHUTE

The Ace of Parachutes

SAFETY CHUTE LANDS VERNE TRENT INTO CATERPILLAR CLUB

(From Verne Trent's Official Report of forced jump
while firing night mail March 25th.)

"A SAFETY CHUTE was being worn, and it certainly worked fast. I don't believe I dropped over a 100 ft. before it opened. On the way down practically no oscillation was noticeable although the air was very rough."

This Chute was one of a rush order we delivered to Eastern Air Transport, Inc., only a few days previous to Pilot Trent's forced jump. . . . We can also give you quick service on SAFETY CHUTES.

Used by Department of Commerce Officials
and Many Famous Flyers

Every Pilot should own a SAFETY CHUTE. Soother, more compact and comfortable . . . of proved superior opening. Write for illustrated folder and special offer.

We also manufacture
Steeple-Chase Flying Tops—Helium
Safety Bats—Wind Cores—Etc.

SWITLIK PARACHUTE & EQUIPMENT CO.
TRENTON NEW JERSEY



On the Water and In the Air

A flying boat must have essentially the same qualities which yourown appreciate in a well built boat," says Louis Schwab, designer of the

aeronautical engineers when a flying boat is to be constructed."

A Safety Record

You will better appreciate the safe flying qualities of the Viking Amphibian or Flying Boat when you know that the plane is the American version of the Schwab P.B.A.—a plane with a record of 6,000,000 miles behind it without a structural accident—a plane that is used as standard equipment in the French Navy.

Fine Performance

In terms of stability, safety and performance the Viking is not equaled by any other flying boat in the same price range. Here is a moderately sized plane equipped with a Wright J-6 225 h.p. engine capable of 112 miles per hour. She gets

off the water like a shot, climbs 600 feet a minute into the air and will cruise 550 miles without refueling.

Seaworthy—Airworthy

But above everything else the Viking is a plane designed for safe flying and is able to withstand strenuous use on the water and in the air. Seven different kinds of wood are used to build her. We shall be glad to send you full particulars about this flying boat. Write to

THE
VIKING FLYING BOAT COMPANY
11 SHELTON AVENUE, NEW HAVEN, CONN.
or Room 1000, CALDWAY ISLAND, New York

THE
**VIKING
FLYING
BOAT**



Viking. "Safety should not be sacrificed for speed . . . stability both on the water and in the air must be the objectives of

Specifications of the Viking Flying Boat

High Speed, 102 mph.; Cruising, 88 mph.; Landing, 40 mph.; Climb (at 5000 feet) 400 ft. per min.; Service Ceiling 14,000 ft.; Fuel Capacity 10 gal.; Range 120 miles; Duration, 4 1/2 hours; Length 29 ft.; 6 in.; Height (on wheels) 11 ft.; 3 in.; Span 42 ft.; 3 in.; Wing Area 441 sq. ft.; Capacity, 4 persons; Engine—Wright J-6, 225 325 hp.

THE KITTYHAWK... *A Plane for Safe Flying Over Land and Sea*

THE Kittyhawk is ever ready to soar into the skies from landing fields of green... ever eager to climb on up into the clouds from waterways of blue. For this flying symbol of freedom, safety and power can be changed from a land plane to a sea plane quickly and easily, as easily as you change a tire. The regular landing gear can be removed and floats attached when necessary.

For Safe Flying

The Kittyhawk is approved by the Department of Commerce both as a land plane and as a sea plane and is noted for its exceptional safe flying

qualities. She is almost impossible to spin, so easy to fly, so responsive to the controls. No wonder this is an ideal plane for touring purposes, such as a sailer to the business man who wants to go or ship things from one place to another speedily and safely. As a land plane, the Kittyhawk leaves the fastest swim far behind; as a seaplane, she outpaces the fastest power boat that rides the waves.

Fine Performance

The Kittyhawk seats three persons, carries a greater load than any other biplane of its size, cruises at ninety and develops one hundred and ten miles per hour when required. She has the ability to climb twelve hundred feet

per minute. Few planes in the same price range if any, can equal her performance and maneuverability under any and all conditions.



The Kittyhawk is the companion plane to the Viking Amphibian and Flying Boat. We shall be glad to send details about both planes upon request.

THE VIKING FLYING BOAT COMPANY
89 Shelton Avenue... NEW HAVEN, CONN.
—PRATT HARBOR, GREENWICH ISLAND, HARTFORD, CONNECTICUT



Specifications of the Kittyhawk

Engine: Evinrude 8-150 hp. Approved Type Certificate No. 118. Length overall 22 ft. 10 in. Height overall 8 ft. 8 in. Span 35 ft. 0 in. Wing area 215 sq. ft. Empty weight 1,100 lb. Gross weight 2,000 lb. Max. weight 2,400 lb. Max. speed 110 mph. Cruise speed 90 mph. Landing speed 30 mph. Climb 1,200 ft. per min.

AVIATION
May 4, 1932

23

What Every Flying Man Knows: *—Any way out*



is a safe way



with his reliable
IRVIN
The Life-Preserver of the Air

HEAD First... Feet First... step off... it's all... show out... dip... out—any way out... of a ship is this any—when this comes in the order of events, be thankful for your IRVIN!

Already, in emergencies, it has saved over 300 lives, including those of many of the most famous of all fliers. Already indeed, it has won far better the most award of universal recognition as the standard aerial life-saving equipment of the world.

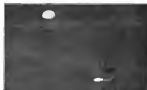
IRVIN Air Chutes for every purpose are available in all parts of the country. Ask your dealer, or address below. Dealers should write the company direct.

"Name, description", our picture picture an approved model, also, about 10/1/32. Air Chutes for every purpose are available in all parts of the country. Ask your dealer, or address below. Dealers should write the company direct.



IRVING AIR CHUTE CO., Inc.
373 Pearl St., Buffalo, N. Y.

West Coast Branch and Office:
Grand Central Air Terminal, Glendale, Calif.



It's Albany...



Bright Nightlighting



Full Nightlighting



Full Nightlighting

You'll find Albany airport "on the map" by night as well as by day --- thanks to Graybar Airport Lighting. This well-lighted field stands out as a haven for the night-flyer... and as another example of Graybar's coast-to-coast experience in



★—small white stars indicate Graybar Airport Lighting in all parts of the country.

lighting the nation's leading flying fields.

... Graybar's Lighting specialists will be glad of the opportunity to work with you on your preliminary plans for airport lighting. (Send the coupon for further information along this line.)

OFFICES BY U.S. PRINCIPAL CITIES. SALESATIVE OFFICES: GRAYBAR BUILDING, NEW YORK, N. Y.

Graybar AIRPORT LIGHTING

COUPON		REF.
Graybar Electric Co., Graybar Bldg., New York.		
Gentlemen: Please send me more information on Airport Lighting.		
NAME.....		
ADDRESS.....		



PURSUIT—Curtiss P-1C



OBSERVATION—Curtiss O-1E

AT Mather Field, California, the U. S. Army Air Corps has just completed its annual Air Maneuvers. The crack fighting units of the Air Corps, with more than 100 of its finest planes, participated, for the Maneuvers represented both as intensive study of tactical problems and a thorough demonstration of the year's progress in the training of personnel and the development of equipment.

For the first time in Air Corps history, all four offensive branches of Army Aviation—Pursuit, Observation, Attack, and Bombardment—were combined in the Maneuvers. In all four branches Curtiss military aircraft (and Curtiss engines) are standard fighting equipment of the Air Corps. The Curtiss P-1C Pursuit, the O-1E Observation, the B-2 Bomber, and the A-3B Attack types, constituted more



BOMBARDMENT—Curtiss B-2

than 50% of all aircraft taking part in the Maneuvers. No other aircraft manufacturer was represented at the Maneuvers in more than one branch. These figures are convincing evidence of the versatility and effectiveness of the Curtiss Group Engineering System in producing high-performance aircraft to meet the exacting requirements of Military Aviation.

CURTISS AEROPLANE &
OFFICES: GARDEN CITY, N. Y.
A DIVISION OF CURTISS

ON THE WESTERN FRONT



THE MANEUVERS—no striking aerial photograph showing some of the 140 planes taking part in the Maneuvers, flying over Butler Field. All of the aircraft in the picture are Curtiss-Wright products.



ATTACK—Curtiss A-3B



P.S. And "Behind the Lines" from the Department of Interiors at Garden City, Curtiss engineers, in cooperation with the Air Corps, have just produced the BT-8, a new Basic Training plane purchased with the Curtiss O-1E engines to which they are fully engaged in the development of several new types of fighting aircraft, all these new types are in service. Next year's Maneuvers will again reflect the progress that is vitally necessary to continued supremacy of our air force.

MOTOR COMPANY, INC.
Factories: GARDEN CITY and BUFFALO, N. Y.
WRIGHT CORPORATION



149 SKF BEARINGS

are on this, the Largest Airplane in the World

NO time to think about bearings...not when the altimeter registers ten thousand feet...not when a hundred trusting passengers are dozing in their seats behind.

No time to wish that the bearings had been purchased upon performance rather than upon price...not when the twelve roaring motors on the wing will continue to roar only so long as the bearings stand up...not when the twenty-four engine genera-

tors are running on them, and lighting dynamo, radio installation and fuel pump depend upon them.

The D-XX

Germany's giant 300 passenger plane is powered with 12 SKF equipped "Scania-Duplex" engines. SKF Bearings take the propeller thrust and are on the crankshafts. Farmington reduction gears, magnetics, lighting dynamo, radio and fuel pumps—a total of 118.

*NOTE: Bearings furnished also for 12 SKF equipped auxiliary light engines and fuel pumps for the "Scania-Duplex" engines.

And so in the D-XX, Germany's new giant one hundred passenger plane, as in practically every other well-known aircraft unit that was ever built, the bearings are SKF. Sixty-five prominent American manufacturers of aircraft and equipment alone use SKF Anti-

Friction Bearings. SKF Industries, Inc., 90 East 34th St., New York, N.Y.

SKF

THE HIGHEST PRICED BEARING IN THE WORLD



just as light as they can be—just as strong as they should be. That's the combination which has made Kelsey-Hayes aircraft landing wheels the standard equipment of the industry.

Kelsey-Hayes Service is World-Wide

AIRCRAFT DIVISION

Kelsey-Hayes Wheel Corporation, Detroit, Michigan

Atlanta, Boston, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, El Paso, Evansville, Fort Worth, Gary, Indianapolis, Kansas City, Louisville, Miami, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, Portland, St. Louis, St. Paul, Toledo, Tulsa, Wichita, Youngstown.

KELSEY-HAYES

AIRCRAFT LANDING WHEELS



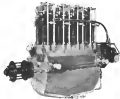
CYLINDERS MACHINED

READY for assembly—a constructive help to the motor manufacturer requiring expert advice and manufacturing.

The casting of air-cooled cylinders requires a profound knowledge of foundry and metallurgical technique. S. Cheney and Son have behind their present organization 25 years of active operation in this most specialized field.

Such co-operation and experience is readily available to any responsible manufacturer. Tell us your requirements with blue prints—we will do the rest.

Users of
Cheney-Cast-Cylinders
Aeronautical Corporation of America
Curtis Aircraft Co.
Curtis Motor Motor Corp.
H. H. Franklin
Hawthorne Co.
Hawthorne Motor Co.
Wright Aeronautical Corporation
Wright Motors Inc.



Illustrations show the Wright Glider cylinder and the Glider motor.

We are ready to furnish castings, patterns and castings or machined cylinders.

S. CHENEY & SON
MANHATTAN, N. Y.

CHENEY ~ CAST ~ CYLINDERS
High Strength ~ Low Cost

Floyd Smith, pilot, for nearly 25 years, wearing his improved Safety Chute, jumping into planes. Note the features of this chute.



Left: Floyd Smith Safety Chute in action, approaching the ground. (Right) Chute opened, in front of Adams-Woodson Building, Buffalo Airport.



Floyd Smith Safety Chutes

Quarant from you should read, behind the evolution of these improved aerial life-savers, by Floyd Smith, first one to produce a free type, manually-operated parachute.

IN 1912 I built a tractor to plan, flew it successfully at many exhibitions—and I was a cyclone at Kensington, Kansas.

From that encounter I was fortunate to get out with my life—for I crashed from 1,800 feet. Since then, for 18 years, I have flown thousands of miles, piloted scores of kinds of aircraft—and studied constantly how to save the loss of those who should it be evident the day for any man, would be at risk in that Kansas corn field.

In this, my interest naturally revolved around parachutes.

Early in 1914 both my wife and I had jumped from a plane—using a type of parachute attached to the plane itself.

But I saw that the arrangement was not practicable. Then, in mid-summer that year while I was jumping, a wing collapsed—and at that moment there came to me, clear out, the vision of the present free type, manually-operated parachute pack.

It all looks simple now. But there were years of baffling problems. Even when General Mitchell's cable came from the front in France, to the U. S. War Department to place me as parachute duty, to work out my idea, it was not another beginning in an unpermeated field.



FLOYD SMITH
Pilot

Then, after months of experimental engineering at McCook field, more months in the Aircraft Production office, there came the day in 1919, while in the Air Service Engineering Division, that the first "free jump" in the world was made in a free type manual parachute—and that in the one I had evolved.

Constant improvement from that day to this makes the new Floyd Smith Safety Chute one that every air operator should see. I am now in position to supply this, on receipt of order, to the commercial aviation interests of the country from the business in which I am basic engaged with the first factory in the world to my command for producing parachutes.

For immediate delivery of these improved Floyd Smith Safety Chutes—write or wire today. Quotations will be returned to our "Propulsion Department."



Floyd Smith
SAFETY CHUTE COMPANY

228 GENESEE BLDG.,

BUFFALO, N. Y.

"ALL SET"

At dependability, in street capability to stand the gaff of the toughest kinds of flying, Skelly Airplane Oil is ranked by name. And its flying mate, Skelly Aerodynamic Gasoline, comes through with the reserve power that pilots like so well in the take-off, in climbing, in starting, and cruising. "All set" with Skelly products means pilots and mechanics are confident of every going aloft. Confidence like that is sure proof that Skelly quality in the air has duplicated its popularity on the ground.

AVIATION SALES DEPARTMENT
SKELLY OIL COMPANY
TULSA, OKLA.



SKELLY
AERODYNAMIC
GASOLINE

SKELLY
AIRPLANE
OIL



SWALLOW

adopts AXELSON ENGINES *exclusively*



Completing exhaustive tests extending over a period of several months, the Swallow Airplane Company of Wichita, Kansas, has completed arrangements whereby Axelson Airplane Engines will be used exclusively in the Swallow 3-Place Training Bi-plane and the Swallow 2-Place Sport Bi-plane. This combination will permit greatly reduced production costs by Swallow and Axelson and will identify Swallow Planes as the outstanding product in their class.

The Axelson 7-Cylinder Airplane Engine is manufactured under approved Type Certificate No. 16.



Axelson Aircraft Engine Company
General Office and Plant: Randolph St., at Doyle Ave.
LOS ANGELES, CALIFORNIA



ECONOMY

Economy embraces both operating cost and first cost. In purchase price, economy arises from intelligent manufacture, based on large buying power and low overhead. In operation, it implies honest performance, carefree service, low weight and long life. Economy, dependability, convenience and smoothness are the four cardinal points of practical aircraft power. All result from the same basic fundamental of construction—precision. Continental Aircraft Engines are economical to buy, own and operate, because they are Precision Built. Continental is producing Practical Aircraft Power.

*Approved Type Certificate No. 30-12, U. S. Department of Commerce

CONTINENTAL AIRCRAFT ENGINE CO.

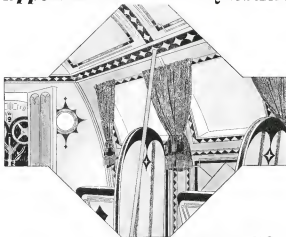
General Office and Factory: Detroit, Michigan

Continental Engines



Drawing upon the facilities and experience of the greatest engine builder in the world, Continental is properly enabled to counsel with the trade in the design and production of engines to fit individual requirements.

Appearance? A Sales Question



Answered by CO-VE-CO

WHEN rich, luxurious, durable, agreeable interiors are desired, whether it be a yacht, your country home or a fine airplane, select Co-Ve-Co plywood. Co-Ve-Co Port Orford Cedar is extremely light in weight and evenly grained. One of its outstanding qualities is the ease with which it can be worked, requiring comparatively little sanding, if any, to bring it to a suitable finish. It does not splinter or put white being put through a planer.

If the wood is to be stained the effort is free from the artificial appearance of other stained woods. The colors seem to be of the very fiber of the wood

itself. Various shades of light brown used so often in early American houses can be duplicated perfectly without effort on the part of the painter. The result is a soft glowing quality at once attractive and appealing to anyone interested in purchasing an airplane.

Co-Ve-Co Port Orford Cedar is economical to buy, reasonably long-lived. As a material it means durable aircraft interiors you should have regardless of Co-Ve-Co Port Orford Cedar and Co-Ve-Co Sitka Spruce plywood. It is not too late to incorporate Co-Ve-Co in your 1938 production plans. Write or wire!

PORT ORFORD CEDAR PRODUCTS COMPANY

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CALIF. PINE & YACHT CO.
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Exclusive Sales Representatives
WANT & BROS. INC.
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TRAVEL BY AIR... FLY YOUR MAIL AND EXPRESS

There is a job for you in Aviation



Practical shop work at a Universal School.



Many graduates of the Universal welding course are employed at good pay in airplane factories.



A typical class room in one of the schools of this national system.



INFORMATION BLANK

UNIVERSAL AVIATION SCHOOLS,
802-411 Avenue A Box 101, St. Louis, Mo.
Please advise me what training I should take
(I prefer position as Pilot)
Name _____ Office Work _____
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City _____ State _____
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My past experience is _____



At least 16 hours training in elementary planes is a part of the regular University curriculum.

Let us help you find it

Do you want to become a pilot? A mechanic? An aviator? Do you want to enter the business end of aviation? This card is the reason with the information which we can and let us advise you how to realize your ambitions.

How We Assist Ambitious Men
When you return the coupon, we study your qualifications. If you need special training to reach your goal, we tell you just what kind you should have. We send you, with our advice, an attractive book telling all about aviation and describing the kinds of training offered in this national system of government approved aviation schools.

A National Employment Service
Universal Aviation Schools are a division of the American Airways, Inc., the world's largest air transportation system. This system is constantly opening new routes and employing additional men. Universal graduates are given first consideration; without new men are employed. And other large transportation systems, airplane manufacturers and aviation supply houses, knowing the high type of training offered in Universal Aviation Schools,

turn to our employment department for men with aviation training.

Why Universal Students Rank High

Universal Aviation Schools are among the few that are government rated and approved. This means that all equipment, instructors and methods of instruction in Universal Schools meet the Department of Commerce requirements. In addition, to receive government approval, these schools must have met graduates who meet the department's high standards. For this reason only men with satisfactory qualifications are accepted in Universal Aviation Schools. Among the courses offered are: Flying, Mechanics, Welding and General Aviation Business Administration. Also an excellent home study course in Aviation.

How to Start in Aviation

Send the coupon giving full details on all questions asked. We will tell in reply what training you need and send you the book, "Aviation—What It Means to You." This book gives instructions regarding standards, cost of training and information you should know. If you want a place in aviation, fill in the coupon and mail



Universal Aviation Schools

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A National System of U. S. Government Approved Schools



Another Advance In Welding Blowpipe Design

WITH the introduction of the new Type W-17 Welding Blowpipe, Oxweld again raises the standards of blowpipe performance.

New principles are incorporated—valuable old principles refined. The result is an entirely new general utility oxy-acetylene welding blowpipe.

The W-17 is light in weight and perfectly balanced. It enables continuous welding without fatigue. It will not backfire. It provides intense heat over a greater area. The goose-neck head facilitates welding in difficult positions.

The W-17 incorporates, of course, the Oxweld low pressure injector principle—assuring maximum economy and efficiency.

Examine the new W-17 carefully at the first opportunity. Write today for detailed information.

Reliable, Economical, Long Lived—
Typically Oxweld

OXWELD ACETYLENE COMPANY

Unit of Union Carbide and Carbon Corporation

NEW YORK

SALES OFFICES IN PRINCIPAL CITIES

IN CANADA: DOMINION OXYGEN CO., LTD., TORONTO

Corsair...

the ideal two place ship for
BUSINESS OR SPORT



FROM your first glimpse of the Corsair... on the ground or in the air... you find yourself admiring the ship tremendously. Fly it and the Corsair's superb handling and masterly performance will captivate and confirm your first impressions.

The quality characteristics of the Corsair make it the ship you need for private use—either business or

sport. Exceptional speed range, maneuverability and climb—the ability to get into and out of the smallest fields, and at high altitudes, too—plenty of reserve power in its "Wasp" engine—sturdiness of construction and reliability of operation—all are inherent in the Corsair.

These qualities have been amply proven by millions of air miles with

the Navy and Marine Corps—in Mexico, South America and the Orient.

The Corsair is available for land or water use—by the simple interchange of landing gear. Equipment and appointments will be provided to meet your specific needs. CHANCE VUGHT CORPORATION, Hartford, Connecticut, Division of United Aircraft & Transport Corporation.

CHANCE VUGHT CORPORATION



Insist On BLACK & DECKER Wire Wheel Brushes



LOOK FOR THE FAMILIAR RED AND BLACK LABEL

BLACK & DECKER WIRE WHEEL BRUSHES are longer lived and more effective because of the quality and density of the tufts. These thick tufts of high carbon steel wire are woven correctly into a finished product which has no equal as a brush for cleaning metal parts.

Brushes do not mat down, nor break off easily—lessening the hazard of injury to operators when buffing.

Standard sizes from 4" to 12" diameter. Equip your bench grinder or 1/4" Heavy Duty Drill with wire wheel brushes for cleaning valves and motor parts.



The BLACK & DECKER MFG. CO.

TOWSON, MD. Toronto, Ontario, Canada
Birmingham, England Sydney, Australia

"With the Pistol Grip and Trigger Switch"



INTEGRAL-CAST ROCKER BOXES

for better valve cooling,
greater rocker arm security
and full protection from
weather

The integral casting of rocker boxes costs money and requires more time in foundry, in machine shop and in assembly. Yet it is a feature which you naturally expect to find in Pratt & Whitney engines. It does provide better valve cooling and insures greater security for the rocker arm and valve springs. In addition integral casting

protects these essential parts from the weather by making it possible completely to enclose the valve gear, guarding against snow, sleet and rain.

This construction is only one of dozens of that Whitney features which contribute that dependability for which the famous "Wasp" and "Hornet" engines are universally known.



THE
PRATT & WHITNEY AIRCRAFT CO.
HARTFORD, CONNECTICUT
U.S. PATENT OFFICE

Wasp & Hornet Engines

Manufactured in Canada by Canadian Pratt & Whitney Aircraft Co. (Inc.), Toronto, P. O. in Continental Europe by Rovere Motor Works, Munich, in Japan by Nakajima Aircraft Works, Tokyo.



CLIMATE

The Priceless Contribution of Los Angeles
County to the Aircraft Industry

Climate is the one factor most vital to the economical operation of the aircraft industry. It is an asset or a liability according to where you locate your plant.

In Los Angeles County, as in no other section of America, the elements favor aeronautics; no extremes of heat or cold... more hours of sunshine... less wind... practically no electrical storms greater visibility... less hazard in the air.

Smaller plant investment suffices here. Labor conditions are ideal. Human efficiency is high. Living conditions are easy. These advantages, peculiar to Southern California, are definitely reflected in the balance sheets of air craft manufacturers in Los Angeles County.

The logical concentration of the aircraft industry in Los Angeles County has developed here an available supply of skilled mechanics, trained pilots and aviation experts unsurpassed in any other American community.

Thousands of 1940 students are constantly in training in all, or more, aviation schools.

There are 54 airports and landing fields.

18 air-mail routes, including 4 trans-continental, base their terminations here.

Air-Minded **LOS ANGELES**
County

Trade and Export to support the above statement with the local aviation industry, a group, National Association, Los Angeles Chamber of Commerce.



WINGS FOR THE ANCHOR POST FENCE COMPANY

THE shattering of a bottle—a few dedicatory words, and the Anchor Post Fence Company Plane taxied to the runway to make its initial flight, inaugurating the establishment of the Anchor Airport Sales Division.

The ever-increasing demand for Anchor Fence Protection from the Aviation Industry has made possible this new service. Capable and experienced "airport-trained" men have been retained to cooperate with Airport Managers in solving their fencing problems. This service is at your command. Just write or telephone the nearest Anchor Sales Office and the Anchor Plane will be directed to your landing field.

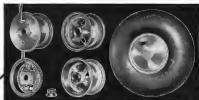
ANCHOR POST FENCE COMPANY
Eastern Avenue and Kane Street
Baltimore, Maryland

Albany Boston Buffalo Charlotte Chicago Cleveland Detroit Hamilton
Houston Los Angeles Minneapolis 21 New York Philadelphia Pittsburgh
St. Louis San Francisco St. Petersburg, Fla.

Representatives in all principal cities. Consult your local classified directory.

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Constant Development Insures Our Continued Leadership



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As America's leading producers of aircraft parts, our policy is one of constant development and improvement. Our engineering staff, composed of national authorities in their respective fields, is responsible for the broad acceptance of our products throughout the industry. Units designed and manufactured by the Aircraft Products Corporation are used in the construction of airplanes produced by 72 American manufacturers. Our manufacturing facilities, geared for mass production on aircraft parts exclusively, and our low selling expense due to the volume of our business and a wide diversity of products, establishes the Aircraft Products Corporation as your logical source of supply. We invite you to participate in the economies of this mass production.

AIRCRAFT PRODUCTS CORPORATION OF AMERICA
DETROIT, MICHIGAN

Aircraft Products CORPORATION





Students and planes of the Charles Dallas, Inc., Flying Club at the Buffalo Airport. This club is the largest one of the Mississippi.

"Using Socony exclusively ... ample proof of my appreciation"

"It is particularly gratifying to note the excellent results in all the different types of motors I have used, regardless of weather conditions.

"The fact that I am using Socony Aviation Gasoline and Socony Aircraft Oils exclusively is ample proof of my appreciation of your products."

So writes Mr. Charles Dallas of Buffalo, distributor for Waco, Stinson, Ryan, Great

Lakes, and Monocraft aeroplanes. The Charles Dallas Flying Club is the largest one of the Mississippi, operating six ships now, and ten ships are to be in commission by June 1st.

Only gasoline and oils of such a standard as to be completely reliable are suited to aviation purposes. It is the consensus of opinion in airports and throughout aviation circles that Socony products are of this high standard.

SOCONY

Aviation Gasoline Aircraft Oils

STANDARD OIL COMPANY OF NEW YORK

FOR
EVERY
FLYING
REASON

They're choosing
STEARMAN



Nothing else quite "fit."... That's why in one single California County, Alameda, a Broker... Student... Rancher... Instructor... Ice Cream Man... Paint Salesman and four prominent Sportsmen... all bear witness to the adaptability of a Stearman to the diversified activities of modern transportation... Stearman... Business Speedster 225 H.P. ... Junior Speedmail 300 H.P. and 400 H.P. ... ships built to tolerances the mark of the stick would specify. Write, Wee Phone STEARMAN AIRCRAFT COMPANY, WICHITA, KANSAS, Division of United Aircraft and Transport Corporation



Kept in one costly row is many. A dozen Stearmans of Alameda County, California



These Atlanta aircraft properties [at the famous Candler Field] are covered with Carey Built-up Roofing



Factory and office of the Atlanta Aircraft Corporation, Candler Field, Atlanta, Ga., are protected by Carey Built-up Roofing—supplied in a built-up layer of Mastic and insulation over a double steel deck. The Flying Company, Contractors and Builders, Atlanta.

To top the Candler Field factory and office of the Atlanta Aircraft Corporation, the contractors and builders specified a Carey Built-up Roof. A careful selection—a logical one—because Carey Specifications so perfectly solve airport and aircraft problems.

Super-durable, super-visible— the Carey "Aeronautic" Roof . . .

This rough-and-tough-textured Carey Built-up Roof was selected, first of all, for its unusual air visibility. Then, too, it is weather-tight, durable, with exceptional elasticity and tensile toughness. Laminated, built up layer upon layer, sealed and resealed again and again. Fulfilling all the existing requirements of sealed roof construction—the Carey Aeronautic Roof! May we tell you, in detail, about Carey Roofing Specifications for Aviation Buildings?

THE PHILIP CAREY COMPANY • Lockland, CINCINNATI, OHIO

Philip **Carey**
Products

For Aviation Field Service:

Carey Corrugated Asphalt Roofing and Siding—for hangars, motor bus sheds, locomotives, etc. Carey Elastic Asphalt Floor—for flooring runways, taxi strips and taxiways. Carey Elastic Expansion Joint—for protecting concrete work against expansion and contraction strains. Carey Wood Insulations—for motor test stands, aviation power plants, etc.



THE AVIAN —for stability in the air

"Flying performance that no other light plane can approach," pilots in 16 countries say of the Avian. Throughout a flight, this plane insures absolute safety. Its structure is many times stronger than the strains of normal flight regime.

Added to the Avian's inherent stability and airworthiness is the safety assured in the Handley-Page wing slots. These slots eliminate danger of spin, improve lateral control and lower landing speed.

No other light plane can equal the Avian for safe performance. It is the ideal plane for sport, business or training. Its flying qualities speed up the solo flight. Finally, the Avian is economical to operate—every gallon of gas gives 20 miles of travel.

Notice the new low price and nine payment plan—send for details.



WHITTELSEY AVIAN

THE OUTSTANDING SPORT AND TRAINING PLANE OF THE WORLD



TO DEALERS AND DISTRIBUTORS

When you do so call the Whittelsey Avian you have something to talk about. The new low price and nine payment plan—send for details. Write for our sales plan and for full data and specifications of the plane itself. The Whittelsey Handwriting Trainer. All General Aviation, Cincinnati, Ohio.

THE COST OF IT

Whittelsey Avian	\$1045
Down Payment	\$1150
Balance monthly payments	
Handley-Page Wing Slots (extra)	\$150



BELLANCA AIRBUS

... a new 12 to 14 place airplane
built for *profit-per-passenger* operation

A PROMINENT aeronautical writer recently published the following statement in the New York Times: "Several conservative operators, and many pilots, either never have dropped that belief in or are now adopting the doctrine of single-engine planes as against multi-engine, for both efficiency and safety."

Never before has discussion so openly engaged into ways and means of cutting operating costs. On every hand, operators are seeking measures of economy which, at the same time, will maintain or increase efficiency and safety. Above the needs of the day, Bellanca announces production of the new AIRBUS as an answer to this problem.

For economy, the AIRBUS will save nearly 40% of the current operating costs per passenger mile as compared with two-engine craft of similar capacity.

For efficiency, the AIRBUS meets the reputation won by its predecessors in every national efficiency contest entered since 1925, and in the commercial service rendered by Bellanca Airbuses over some of the world's most important and isolated routes.

For safety, the builders of the AIRBUS possess the same degree of self-flying stability—the same accompanying standards of structural strength—as have been proved in the many Bellanca planes which, since 1908, have earned a perfect safety score. Above all, the AIRBUS is a plane which passengers will like! Its large, comfortable cabin carries as passengers and one pilot, or 13 passengers and two pilots, with ample space for baggage. Because of the unusual reserve performance, the AIRBUS will carry the large and profitable payload with utmost ease, on either wheel gear or floats, at—with a special combination of both—as an amphibian.

Here is a summary of data:

DIMENSIONS	USEFUL LOAD		
	45 ft.	Classified winged	1 ton lbs.
Span	45 ft.	45 ft.	1000 lbs.
Length	28 ft. 6 in.	45 ft.	1000 lbs.
Height	10 ft. 6 in.	45 ft.	1000 lbs.
		Forward 12 passengers and baggage	1000 lbs.
		Total useful load	1000 lbs.

POWER PLANT

Reciprocating engine mounting in accordance with the Pratt & Whitney Model 640-1500, or the Cessna Company, all standard, a 14-cylinder, approximately 200 h.p. at 2500 r.p.m.

PERFORMANCE

Full speed
Cruising speed
Climb
Range at cruising speed

140 m.p.h.
140 m.p.h.
1000 ft. per min.
1000 miles

Now in active production, we are ready to quote delivery dates for this plane to interested operators.

BELLANCA AIRCRAFT CORPORATION
NEW CASTLE, DELAWARE

BELLANCA

Why bother with deaf-and-dumb signs?



SAYS an instructor to his student—"Now remember, when I put out the right hand, I want right rudder. The left hand—left rudder. Savvy?"

But why go to the trouble—when it's so much easier, so much pleasanter, and so much clearer—to use Communicating Helms?

Let the engine roar, let the wires whistle, you have only to whisper through these finely functioning Spalding Sets—and the student, or passenger, will hear you perfectly. And there won't be any misunderstandings.

Made of velvety-soft brown capelin—lined with channels—with Spalding patented ear profts and metal attachments, and detachable metal tubes... Spalding Helms Sets can be used with the communicating tubes, or without.

Spalding single helms with communicating tubes—\$13.50. And if it's all right with you to have the student talk back—get a double set, at \$25.00.

Spalding has a complete stock of flying equipment. It is carried by all Spalding stores, and at many of the leading fields. Or let us send you the free catalog.

CLIP FOR FREE AVIATION CATALOG

A. G. Spalding & Sons, Inc.

135 Nassau Street, New York City

Please send Free Aviation Catalog

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Street _____

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A. G. Spalding & Sons
AVIATION EQUIPMENT

PACKARD-DIESEL AIRCRAFT ENGINE

**Detroit to Miami
at a fuel cost
of less than
one cent
per mile!**

IN a Packard-Diesel equipped plane, Captain L. M. Washen, chief aeronautical engineer of the Packard Motor Car Company and Walter Lees, test pilot, recently flew from Detroit to Miami, Florida, on \$8.50 worth of ordinary furnace oil.

The airline distance between the two cities is approximately 1200 miles—which means that the fuel cost averaged less than one cent per mile! Non-stop, the trip was made in 10 hours and 15 minutes.

This flight strikingly demonstrated the economy and reliability of the Packard-Diesel Aircraft Engine. Tested by the Army and approved by the Department of Commerce, it has introduced to Aviation a revolutionary new powerplant.

The Packard-Diesel Aircraft Engine, A. T. C. No. 43, develops 225 H. P. at 1500 revolutions per minute and weighs only 2,26 pounds per horsepower. It starts easily, responds to the throttle instantly, and operates smoothly at all speeds.

Several manufacturers are already offering planes equipped with the



Captain L. M. Washen (left), chief aeronautical engineer of the Packard Motor Car Company and Walter Lees, test pilot, with the Packard-Diesel equipped plane in which they made the record flight from Detroit to Miami.

Packard-Diesel Aircraft Engine.

Now in quantity production, the Packard-Diesel is available to all commercial aircraft manufacturers.



PACKARD MOTOR CAR COMPANY, Master Motor Builders
DETROIT, MICHIGAN

PROTECTION

CHINA'S Great Wall of China furnishes one of the most out-



UDYLITE is the electrolytic application of pure cadmium to base metals for protection against rust.

Udylite
RUST PROOFS
BUILT BY THE PACKARD MOTOR CAR COMPANY

UDYLITE PROCESS COMPANY

Sales Office:
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standing examples of protection.

Manufacturers interested in protecting their products against rust and corrosion should investigate the universally adopted Udylite process.

Over six hundred concerns representing practically every industry are now doing Udylite plating in their own plants.

Why not request full information now?



FORD PLANE PRICES REDUCED . . .

EFFECTIVE IMMEDIATELY

Now, at a time when the aviation industry needs the encouragement of every economy in operation costs, radical reduction in price of all three models of the Ford tri-motored, all-metal transport plane has been made.

The savings on the new price scale amount to as much as \$5000 out from the price of the 5-AT model, powered by three Pratt & Whitney Wasp engines, to carry fourteen passengers.

NOTE THESE REDUCTIONS IN PRICE

Model	Previous Price	New Price
5-AT (3 P & W Wasp engines)	\$55,000	\$50,000
4-AT (3 Wright J-6 engines)	42,000	40,000
9-A (3 Wasp Junior engines)	42,000	40,000
13-A (3 Packard D-12 engines)	43,000	40,000
3-AT (3 Wasp engine, 2 Wasp Junior engines)	51,000	47,000

The most modern scientific principles are being constantly applied to bring these great machines as near mechanical perfection as possible. The EXTRAORDINARY RECORD OF FORD TRI-MOTORED, ALL-METAL PLANES IN OPERATION ALL OVER THE WORLD FOR MILITARY, SCIENTIFIC, AND COMMERCIAL TRANSPORT BUTY THOROUGHLY SUBSTANTIATES THE GREAT CONFIDENCE THE FLYING PUBLIC FEELS IN THEM.

FORD MOTOR COMPANY

Planes are always on hand at the Ford Airport at Detroit

THE FORD PLANE

The Ford plane is planned, constructed and operated as a commercial transport. Built of corrugated aluminum alloys, it has great structural strength and durability, and is most economical to maintain in operation. The superiority of its material is demonstrated by scientific test. All planes have three engines in order to insure reserve power to meet and overcome all emergencies. The engines may be Wright, Pratt & Whitney or Packard Diesel, totaling from 675 to 1275 horse-power. Ford planes have a cruising range of from 500 to 650 miles at speeds between 115 and 135 miles per hour. Loads may be carried weighing from 2000 to 6000 pounds.

The capacity of these planes is 9 to 15 passengers and a crew of two (pilot and assistant). Planes can be equipped with a heater, toilet, running water, electric lights, adjustable chairs.

The price of the Ford tri-motored, all-metal plane is exceptionally low because of its highly scientific methods of commercial production. Price is \$50,000 to \$55,000 at Dearborn.

Consult Ford branches for information on the Ford tri-motored, all-metal plane in all models.

FOKKER PRICES REDUCED

\$4,000 to \$13,000

CERTAIN economies have resulted from the affiliation of Fokker and General Motors. Due to production and purchasing principles, based on many years of successful experience in manufacturing, costs have been sharply reduced. Quality of material and thoroughness of construction have, of course, been maintained at the high standard the industry expects from Fokker. These economies are now manifested in the following reductions which are effective immediately:

	OLD PRICE	REDUCED	NEW PRICE
Standard Universal—Seven places . . .	\$15,000	\$ 4,000	\$ 11,000
Super-Universal—Seven places . . .	\$21,000	\$ 4,300	\$ 17,500
F 14 A Mail Plane—Nine places . . .	\$26,500	\$ 4,000	\$ 22,500
F 11 A Flying Boat—Eight places . . .	\$40,000	\$ 7,500	\$ 32,500
F 11 A Amphibian—Eight places . . .	\$42,000	\$ 8,225	\$ 33,775
F 10 A Trimotor—Fourteen places . . .	\$67,500	\$13,000	\$ 54,500
F 52 Four Motors—Thirty-two places . . .	\$ — — —	\$ — — —	\$110,000

Prices Figuring Factory

FOKKER

AIRCRAFT CORPORATION

AFFILIATED WITH GENERAL MOTORS

General Motors Building, New York City

When a Salesman Travels By Air



THE head of Miller and Company smiled broadly and beckoned Carter to his desk. For a reputationly hard-boded, hard-bent-of-business man he seemed surprisingly affable as he shook hands with the young salesman.

"Glad to see you, Carter. We just closed a big contract that means doubling the order for steel which I gave you last week. I want you to come because I don't want to trust the details to a letter. But how on earth did you get here so quickly?"

"That's just it," Carter replied. "I didn't do it on earth—come over in my new Travel Air airplane. When I got

your wire, I hopped over to see if we couldn't get everything arranged up today so as to get the work started.

"How did I come to buy a plane?" Well, I am out for my firm's best as the man with the biggest air mail's sales. As my customers are scattered about the country I bought the Travel Air to keep 'em within easy reach. It's a great ship to get you around—comfortable, safe, and easy to fly. Then, the 225 h.p. Wright Whirlwind gives her a cruising speed of 164 miles per hour. After we straighten out this order, Mr. Miller, won't you come out and let us show you how easily she flies?"

Needless to say Bill Carter flew away with the big prize. And so impressed with his enterprise and success were the directors of his firm, that they decided to investigate the application of

a plane to their business. Their study soon revealed that tremendous savings in time and money could be effected with a plane, and resulted in the early purchase of another Travel Air—this time a six-place monoplane, ideally suited to the needs of business efficiency.

Executives who desire information about the use of the airplane in business will be interested to know how Travel Airs are profitably serving many industries. For full details address Dept. T 53

Sales Division
CURTISS-WRIGHT
CORPORATION
27 West 57th Street • New York



The Travel Air biplane carries three. Powered with 100 h.p. Wright Whirlwind, it cruises at 120 m.p.h. in a 1,000-mile range of 225 miles.

A PLANE FOR EVERY PURPOSE

TRAVEL AIR

The Travel Air six-place carries six. Powered with 225 h.p. Wright Whirlwind, it cruises at 164 m.p.h. in a 1,000-mile range of 225 miles.

*Latest Upholstery Fabric
for
Modern Transportation*

WM. WIESE & CO., INC.
234 WEST 56TH STREET
New York

New Great Lakes OPERATING DEALER PLAN *means greater* PROFITS



Improved Great Lakes Trainer
New low price \$3190

HERE'S a square-shooting franchise that gives the alert Operating-Dealer a chance to show a worth-while profit at the end of every year! Here's a franchise written for the dealer . . .

backed by support that really means something! • The new, improved 1950 model Great Lakes Trainer is the ideal flying school ship; suitable for both advanced and elementary training. It's economical to buy, economical to operate. It's neat and trim . . . handles to suit a king's taste! At \$3190 (flyaway, Cleveland) the Great Lakes Trainer has an instant appeal to the graduate student buyer . . . almost sells itself. And even at this low price, there's an ample margin of profit for you. National advertising helps build good will for the Great Lakes Trainer; performance of the ship itself builds ready sales. • Cash is as this great opportunity. Get into the money-making end of flying. We'll tell you how to go about it; how to get your school as a paying basis; how to interest capital in your enterprise; how to maintain a profitable service hangar. Write us a letter, telling all about yourself, your experience, your plans and the flying situation in your community. Address Great Lakes Aircraft Corporation, 16465 St. Clair Ave., Cleveland, Ohio.

Manufactured under U.S. Department of Commerce Approved Type Certificate Number 228

GREAT LAKES
CORPORATION



AIRCRAFT
CLEVELAND

Contractors to the United States

Army and Navy 1916-19

CONFIDENT . . . of a clear field for landing . . .



PITTSBURGH CHAIN-LINK FENCE is ideally suited to airport enclosures. It affords no toe-hold for climbing, is sturdily built to resist the pressure of crowds, and will perform its job under the most severe tests. Pittsburgh Chain-Link Fence is good-looking, and offers an unobstructed view for legitimate on-lookers.

Made of the finest special formula, heavy open hearth copper bearing steel, and hot zinc-coated after weaving with a smooth, extra-heavy and well bonded coating of pure zinc, Pittsburgh Chain-Link Fence is designed to retain its shape and appearance and weather the years with a minimum of maintenance.

Make your airport safe for visiting pilots and it will become a popular part of city.

When crowds are held in control by proper fencing of the airport, pilots can approach the field with complete confidence that it will be clear

Erection service is available any place. Write for specifications and descriptive literature.

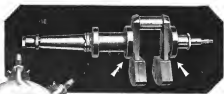
Pittsburgh Steel Co.

Union Trust Bldg. Pittsburgh, Pa.
New York Chicago Memphis Detroit San Francisco Dallas



Pittsburgh Fence
CHAIN-LINK TYPE

The "Comet" Aircraft Engine—Comet Engine Corporation, Madison, Wisconsin manufacturers.



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Below—Interior of Curtiss "Condor" transportation plane showing how any desired soundproof effect can be applied over J-M Cable Insulation.



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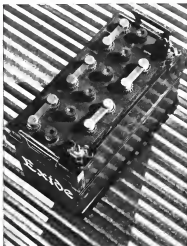
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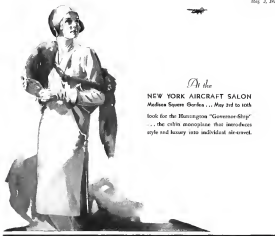


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AVIATION

THE OLDEST AMERICAN AERONAUTICAL MAGAZINE

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EDWARD F. WARNER, Editor

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The Metropolitan Market

FOR THE THIRD TIME in three months the somewhat hushed and jaded aircraft industry is assembling for a show of virtually national significance. Advertising the location that allows continuous admittance the necessity of some organization that will reduce the confusion and that will mark the distinction between the national and the local show more sharply than it has yet been drawn, diff any serious attempt to sell airplanes by displaying them to the population of the area that centers around Manhattan Island is of inevitable concern to every manufacturer of planes or of parts. The first show in two years to be held in that area with the sanction of the Aeronautical Chamber of Commerce is bound to be an event of somewhat more than local interest.

To those who seek to keep a critical eye upon the aircraft industry as a whole and upon its business methods, the most interesting feature of the New York display is not going to be the technical detail of the equipment shown there, but rather the conduct and the apparent intentions of those who show it. The New York Show offers another opportunity of seeing how much the typical distributor, or at least the typical factory sales department, has really learned about showing his product to the public and about planning a specific selling method directed to a specific section of the market. In a show of which the major interest is technical, and where a large number of new designs of great importance are revealed for the first time, a certain shakiness in selling methods and some discourteousness of approach to the public is to be forgiven if not to be approved. At a show in which the participants are a mixed group of distributors and manufacturers, and which is held in a

center of the aircraft industry and attended largely by those whose interest is more in purchasing than in purchasing, some such confusion of selling purpose and paralysis of individual selling effort as was partially manifested in some quarters at Detroit must be accepted as more or less natural, although by no means commendable from the point of view of the industry's finances. The New York Show will offer no such excuse to the exhibitor. It will put upon the exhibitors, and especially in those cases in which the exhibit is in sole charge of the local distributor a problem of dealing with a very sophisticated in fact a unique, market.

As an outlet for luxury products in the United States, New York takes first rank. Even now, in spite of the amazing growth in population and wealth during the past few years of Los Angeles, Detroit, Cleveland, and various other cities, the market which has its root in the financial operations of lower Manhattan remains pre-eminent in average unit capacity for articles of high price. Of foreign automobiles and of custom built bodies New York gets far more than its share. Of "commuting" motor boats at from \$15,000 to \$100,000 upon Mexico. In buying aircraft the Gotham area has been relatively laggard, partly because of the lack of airports, but with steady improvement being made upon that point the opportunity exists for a greatly increased consumption of airplanes. The buying power is there. There are many hundreds of thousands of sales, perhaps more than in any other part of the United States, that have not yet been made, but of which the non-completion has been entirely free from any influence of the monetary factor. There will be a great mass people in the neigh-

horde of Madison Square Garden next week who could buy an airplane without a moment's hesitation or concern over its price or its operating cost. A considerable number of them will get inside the Garden and look around. If they leave without at least a tentative decision to buy an airplane it will be because they, average citizens of average conservatism, have not been persuaded that they can use one with reasonable convenience, pleasure, regularity, and safety, and thereby save a substantial amount of time or trouble in their personal affairs or in the conduct of their business. There is the test for the industry.

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Lionel H. Woolson

A GAIN we make a successful pause to pay tribute to the genius of a great leader of the aircraft industry. As we here takes Captain Woolson from among his friends, co-workers, and available rivals at a moment that would have been a fitting obituary for any career. Just four weeks ago we were privileged to reveal the details of the engine upon which he had labored for three years. In general outline and in detail it bore its stamp and its victories were his personal triumph. It is no discredit to other exhibitors, or to other contributors of engineering papers, to say that Captain Woolson's engine was the dominant feature of the Detroit Show and that his paper describing it is a durable and recording the episodes of its development was the high light of the Detroit meeting of the Society of Automotive Engineers. His meeting of the Society of Automotive Engineers is the one has a permanent place in aeronautical history as the one who took the competition-ignition engine for aeronautical purposes out of the realm of controversy and put it to rest in the air. His name will gain added strength in proportion as that type of engine gains added strength in the aeronautical world.

There have been many men who have accomplished one notable feat, and those who have been best were least able to understand how they had done it. Among those who knew Captain Woolson, and who had known him earlier well, no such question and no suspicion of a lucky break ever arose. He approached to the ideal engineer. He combined imagination, profound theoretical knowledge, practical skill and recognition of practical limitations, caution and reserve in pursuit of accomplishment, and an ever-warm enthusiasm. Given the desire to promote the development of any engineering activity, no better man could have been found to undertake the work.

All that is significant enough in any way, but it is personality rather than attainment that is the subject of mere mourning. To Lionel Woolson it stands for one man as an engineer was accidental. He was a true craftsman, in the best and narrow sense of that word.

desert from. Certain modest and generous words have marked him, and did, in any activity.

"Death, it's a varied instrument,
Showering the living fairs which embrace
The modest intellects institute
Laps in low men Bloor's best design."

//

Personal Liberty and Flying

ANY person individual can drink any thing, at any time, and to say nothing that he chooses—within the limits of his friends' endurance—without our using editorial space to comment upon his personal taste so long as he remains a private citizen, without effect on the progress of aviation. But—however they may be voting with the *Livestock Digest*, it is a safe bet that every man, woman, and child in this or any other country is to comprehend a trip by air means the pilots, mechanics, and officials of the transport line to be the soberest most efficient and most dependable body of men anywhere. Generally speaking, the passenger can feel confident that that very natural desire on his part is fulfilled. Taken as a whole, the men who run air transport set a very high standard.

However, those who come into indirect contact with aeronautical operations, as customers or as mere onlookers, are in no position to make a definite distinction between the cheap and the great care to realize the difference between the responsibilities that be upon the operating personnel of an air line on the one hand and the salesmen for aircraft accessory companies on the other. To the great public, at least in the first stages of its contact with aviation and of its really developing interest in aeronautical affairs, "It's all aviation" and the industry's answers and records are made the subject of categorical conclusions.

There exists the official fostering of organized drinking on the ground scale a much more serious matter than it would be if it affected only those engaged in it. It is too serious to be overlooked. Where it exists it is stirring a strange blow at public confidence, which the aircraft industry needs more than anything else in the world. When companies attached to and allied with the aviation business and passively doing all in their power for advancement will go to considerable trouble and expense to promote the booze-fund and the equipment, not merely to a wide after-the-fact conviviality but for a prolonged collective spree, it is time to call a halt. That any line operating its own planes can function such expenses and still demand that its pilots remain sober at all times surpasses our understanding.

Now, more than at any other time in history, the aviation industry should be free from all taint of alcoholism.

Too many kind rumors of plane crashes supposedly traceable to booze have gone about. It is time to help public confidence and gain acceptance of all phases of aviation by most accurate and accurate standards of personal conduct of the most rigid sort. The industry's rules for their operating personnel are valuable and almost flawless, and were so long before there was a prohibition law. Unpleasant though it is to try to regulate personal conduct, the air lines cannot afford to accept in any detail a lower standard for their personnel than that maintained by surface transport. A little of the sense of leadership given by the officials of the Association Branch of the Department of Commerce, ever since the time when Secretary MacCracken announced that there was a flat rule against drinking by field and technical personnel and that went for everybody, high and low, is always in order.

It may be necessary to raise this subject at all. We consumed upon it sufficiently last summer, and at that time the situation seemed distinctly more than it does now. Certainly there has been less excessive and offensive drinking at the shows this winter and spring than at any previous exhibitions within the memory of the oldest exhibitor. Even at the industry and the operating personnel were untamable in their good intentions, however, we should still feel called upon to protest against the ill-judged generosity of non-contributors of commerce and releasing companies which when their towns are visited by air tours or even by individual pilots, feel that the excess of hospitality and the apparent order and decorum of visitors require that the manufacture and distribution of cocktails immediately be put on a mass production basis. However varied may be the sentiments of the individuals treated to parties, the aircraft industry is a whole might to make its bulk of sympathy with that type of entertainment as emphatic as possible.

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Creating a Market

EVENTS of the past six months have thoroughly demonstrated to the aeronautical industry that the brand popular market for aircraft does not yet exist. The market upon which manufacturing programs and sales organizations are now primarily based is the internal one, consisting of transport lines and miscellaneous air service organizations, a restricted field at best.

Air-connection has been one word as a sales factor. Popular enthusiasm for flying has often meant enthusiasm for flying by the other fellow. We have yet to sell most individuals upon the desirability of their taking to the air themselves as a matter of regular habit. A popular market must be liberally created before we can hope to see anything like quantity production of aircraft.

Publicity, advertising, and occasional exploits by famous pilots have been used to the amount to build to a highly coherent picture of aviation's future. Such activities are usually performances in actual demonstration of the airplane's capabilities, and will have been strictly wasted unless individuals are given demonstration flights and are sold—one at a time—on the convenience and desirability of personal use and ownership of aircraft.

The airplane is widely known to everyone in the abstract. To one is still to unknown quality and quantity with the bulk of the general public. Take any other new product, flying must be actually demonstrated before it will be accepted. The established way to gain acceptance for a product is to distribute samples, which speak for themselves concerning the merits of the product. Periodic broad, strong critics, razor blades are all paralleled on this basis. A faithful student at public markets could have on free samples of food products. Everyone is familiar with the fact that he may have an automobile and driver at his disposal without definite obligation, at almost no cost by telephoning almost any automobile dealer.

The automobile did not gain spontaneous acceptance when it was first introduced. Seriously restrictive laws were passed against its use in many localities, some of them being still very much in evidence. The automobile gained general acceptance because it was constantly being demonstrated to all prospective purchasers. Not only were the dealers' showcases in the good work, but almost anyone could and did obtain free automobile rides regularly from good neighbors who had preceded him in ownership.

Flying is no longer heroic. It is now as commonplace as the morning breeze. Men who automatically become heroes by willing that they could fly have not always been so willing to avoid the same honor to the rest of the general public. From the standpoint of the airplane manufacturer, money at a popular market, the businessman and the "go-brother" have been selling something which should have been given away. If we ever hope to create a popular market for airplanes we must give the prospective purchaser liberal demonstration free of charge. So long as sales pay cash simply for the advantage of getting into the air the airplane will seek among novelties, and there will be no "popular" airplane market. No one thinks of paying for a ride around a track in an automobile, yet once they did just that. On the other hand, legitimate mass for the aerial tour or sightseeing plane should be expanded just as those for the automobile have been. No legitimate use of the airplane will be barred by a liberal policy with regard to flight demonstrations to anyone who can pay any amount of the acquisition be considered a prospective purchaser of an airplane. Aircraft factories, dealers, and distributors must maintain such a policy, which some of them have already adopted, if sales volume is to be satisfactorily increased.

New York Shows OF THE PAST

Six Exhibitions, From 1912 to 1930, Have Had Widely Varying Purposes and Results

By CHARLES E. NOYES
Assistant Editor of AVIATION

WITH the somewhat aviation title of "First International Aeronautical Exhibition," an aviation show was held in the Grand Central Palace, New York City, May 9-18, 1912, under the auspices of the Aero Club of America. While it was frankly following the lead of the Paris exposition of 1906 and 1911, most of the exhibits were American. Altogether about fifteen planes and an racing engine were shown. Considerable public interest was created and more than

half of the 10,000 celebrities invited were present at the formal opening, which was presided over by Admiral American. The daily attendance, however, was numbered in hundreds rather than thousands.

Since that time, only five aviation shows have been held in the world's largest city. While this has been due in part to the difficulty and expense of finding a suitable location, it must also be admitted that not all of the fairs have been completely successful. Unusually



A scene at the 1912 exposition at Grand Central Palace



Exhibits at the New York show in 1912 held at the Grand Central Palace

below and after America's participation in the War, interest in aviation aviation was sufficient to make possible two exhibitions which were quite popular. The 1918, 1917, were the dates of the Pan-American Aeronautical Exposition and Convention, which drew delegates from 25 countries, and a total attendance of about 73,000. March 1-15, 1919, the Manufacturers Aircraft Association held a First Annual Aeronautical Exposition, reported to have attracted over half a million people. But the results of the Second Annual Exposition, held March 6-13, 1920, were not considered sufficiently encouraging to warrant a third.

IT WAS NINE YEARS before another aeronautical exhibition was attempted in New York. In February, 1929, America's Post No. 745 of the American Legion held a New York Aviation Show in the Grand Central Palace again which attracted an actual paid attendance of over 125,000. This show was repeated in 1930, and while the attendance fell off about 25,000, it was still sufficiently successful so that the organizers have tentatively their intention of making it an annual event. They have, however, succeeded in obtaining sanction from the Aeronautical Chamber of Commerce and as a result the Metropolitan Dealers-Distributors Section of the Chamber has organized the New York Aircraft Sales, which will be held in Madison Square Garden May 3-9. Unless satisfactory arrangements can be made for combining it with the Aviation Post show, this is also planned as an annual event and after so many years with none, New York may feel itself heralded with two yearly aircraft expositions.

The record of New York shows of the past is thus an uneven one. All of them have been interesting, though the financial and technical results were occasionally somewhat disappointing. On the other hand, the only three which were well publicized in 1912, 1929, and 1930, did very well. The others received only a few scattering newspaper notices, and a majority of the general public never even knew that they were going on. This situation obviously is not likely to be repeated. On the eve of the first structured New York show since

the formation of the Aeronautical Chamber of Commerce, it is interesting to recapitulate the experience of previous expositions.

The "First International Aeronautical Exhibition," in 1912, was opened the evening of May 9 to a specially invited group of people alleged to be present, numbering about 5,000. During the afternoon, President W. J. Gifford of the Aero Club had created considerable interest and admiration by flying from his house at Keyport N. J., to the side of the U. S. S. Washington, flag day of the Atlantic fleet, which was anchored in the Hudson River off Wall Street. He turned his "hydroplane" over to the ship, and dived on board with a rope ladder to pay his respects to Admiral Oberholser. That novel and dramatic illustration of the possible use of aircraft for private transportation helped materially in creating interest in the exhibition.

Of the planes which were shown, several have historic interest for their adjustments, others included some type of design which have since been successfully developed and yet others possessed points of originality that have sunk into forgetful oblivion. The greatest American, naturally, was given to the Wright Model "C" Flyer, a final descendant of the plane which had been flown at Kitty Hawk four years before, and of the Wright plane which had been extensively demonstrated during the interval. Structurally, it did not differ greatly from its predecessors. Aside from the fact that it was built to take off from and land on the water instead of a field, the Gullwing "wing hydroplane" was also fairly similar to earlier models built by the same designer.

An important novelty in this country, on the other hand, was the Burgess military trainer, the first American war machine which approximated the design of those which have since come into common use. It was also noteworthy in that it was fitted with radio equipment, later successfully operated in flight. It was intended, of course, only for observation, as no military plan up to that time had been seriously designed for fighting.

The most unusual plane at the show was the "Gullwing." It was a well streamlined monoplane, with a large fuselage of which the nose completely housed the natu-

engine cooled through performance in the water. The design of Edgar P. Galt, chief, a pioneer who had a prominent place in the industry for many years after 1912, its streamlined fuselage showed some of the most carefully designed modern speed planes, but the high characteristics proved to be somewhat alarming. Its propeller was mounted behind the fuselage and was driven by a long shaft extending the length of the fuselage. This arrangement was not altogether happy, and later models were built to traction.

The largest plane exhibited was the 2,000-hp. Jacobs-Hamman multi-place, intended to carry four passengers, which had two 350-hp engines. Optimistic reports credited it with flight performance that would be marvellous even for a modern sea airplane. Others were the Columbia-Crossland light; the Duane "Amulet," designed by George Loering; a Burgess-Wright "hydroplane"; and others, including American modifications of foreign designs. There was also an extensive showing of aircraft engines, ranging from the V-twin 100-cylinder Curtiss engine type rated to the 55-hp, single-cylinder Curtiss-Wright had a six-cylinder, 30-hp engine. Others were the Triebel and Macdonell rotary engines, the Sterns, Max Arm, Hall Scott-Mission, Robert-Foster, and Bend rotary-type.



The 1939 exhibition show at Grand Central Station.

Model V, with a 120-hp Hispano-Suiza engine. The company also showed the Model H plane, four-cylinder, 75-hp, and eight-cylinder 180-hp Hispano-Suiza engines, built under license in this country.

Curtiss Aeroplane & Motor Company showed the JN-4B training plane, which was slowly beginning to show a reputation. A Model F flying boat was bought for private use by P. T. de Witt, the present Assistant Secretary of War for Aeronautics. Together with these, the company exhibited a motor-driven motor called the "Asaphus," a fairly conventional four-passenger automobile with a body mounted on four wheels and connected with a single aircraft engine. The engine in the proper automobile position, was mounted to drive a motor propeller by means of shaft and chain drive, V-8, V-10 and V-12 engines made up the balance of the exhibit.

New engines were appearing among the other exhibits, which were destined to become famous. L. W. F. showed a 140-hp, reconnaissance engine, built for the U. S. Government and later built on order for the British Government. Aeromarine had a training truck, a tractor engine, designed by Charles Willard, an eight-cylinder engine and a propeller drive. Other planes shown were a Thomas-Morse biplane; Standard B-2 plane with 125-hp Hall-Scott engine; Curtiss type airplane exhibited by J. D. Cooper, Wisconsin; Lewis training tractor; Beechcraft flying boat; S. S. Pierce Company showed a small "aeromarine" biplane with a novel monocoque fuselage and a three-cylinder engine. The largest of the machines was a Burgess seaplane. Standard Aircraft Company exhibited recovered wing sections and other parts showing the steps in the construction of a plane.

The United States Government was represented by Army, Navy, Signal Corps, Bureau of Standards, Weather Bureau, Geodetic Survey, and Special War Department exhibits. Connecticut Aircraft Company had a large model of a biplane with an airplane fuselage in place of the usual gondola. Goodyear Rubber Company exhibited a kite balloon, for military observation, of original design. Two Aeromarine-built LeBlond rotary



Part of the American exhibit show at 1939.

engines, and especially a 100-hp, Goosene rotary built by General Vehicle Company attracted considerable attention for their compact design and workmanship. Thomas and Sherwood both exhibited 140-hp, "aeromarine" engines, while the Packard and Knox twelve- and eight-cylinder 300-hp engines were much remarked upon because of their size. Wisconsin and Duesenberg were also among the well-known names of engine exhibitors. The Sperry Gyroscope Company showed an "aeromarine" pilot and a synchronous drive indicator. An important exhibit ready at this Exposition was the formation, Feb. 9, of the Manufacturers Aircraft Association which helped so materially in straightening out the tangled patent situation during the War.

A second Pan-American Aeronautics Exposition was planned for Feb. 16-23, 1939, and delegates were named, but it was cancelled almost at the last moment because it was not considered wise to attempt to provide transportation facilities for so many delegates and visitors in wartime. The next show, consequently, was the First Annual Aeronautical Exposition held in (old) Madison Square Garden and the 9th Regiment Armory, March 1-15, 1939 under the patronage of Manufacturers Aircraft Association. Naturally, new machines predominated and it was reported that over half a million people went to see them. In any case it was the most successful show which has been held thus far.

Among the military planes were Spad, Breguet, Caproni, S.E.5, Curtiss, and a German Albatross. The Martin bomber, with its two Liberty engines and the 350-hp. Hamilton type capable of carrying five Lewis guns and a useful load of 2,000 lb., was the center of interest. The show was attended daily in the thousands, received a considerable amount of free publicity, including newspaper pictures. For the first time, manufacturers advertised extensively in the general public Capital Aircraft & Motor Company had a two-page program advertisement in the Sunday Times during the show week, while, Martin, Glendine, L.W.F., Caproni, and Dayton-Wright each had half a page.

Civilian planes were not entirely neglected. The

Dayton-Wright Company exhibited both a "radial" and a "hydroplane" type, covered cockpit biplane for two passengers, adapted from the Dr. Davidson biplane. Glendine showed a small "Glendine Flycatcher" monoplane which was intended to provide cheap civilian flying. There was also the "Loering 'Kitten'" a seaplane weighing 500 lb., with a 75-hp wing spread.

In striking contrast were the P-54, Navy seaplane weighing 13,000 lb. loaded, and the Caproni with 120-hp span which had three 400-hp Hispano-Suiza engines. Wright-Martin showed a Loering monoplane in which Major Schreiner had previously set an altitude record carrying two passengers, and Curtiss exhibited the 100-hp triplane which was then claimed to be the fastest plane in the world. Packard, Thomas-Morse and L.W.F. were also among the military exhibits, with 30 planes in the show, and there were 86 special airworthy exhibits. Goodyear had a spherical balloon, and Burgess a dirigible car intended for service as well as military observation use. It is worth noting that while the 1912 and 1917 shows were advertised and referred to entirely in the sport sections of the newspapers, this 1919 exposition was advertised in the theater section and reviewed as an entertainment.

In 1920, March 6-13, the Manufacturers Aircraft Association arranged to stage a strictly commercial show. Places were priced at from \$2,500 to \$30,000, and for the first time someone was present to interview prospects. While some military designs were present, they were largely concerned for private or business use, and the machines bore names such as "Aerial Paladium," "Aerial Corps," "Aerial Freighter," "Chicago Mail plane" and "Flying Lincolnton." Altogether, seventeen planes were shown by ten manufacturers, and twelve engines, in seven manufacturers. In addition, there was a Goodyear eight-passenger passenger plane and sixteen other exhibits.

L.W.F. showed the "Bitterly," a monoplane with 20-hp. engine, capable of 72 mph and selling for \$2,500. In contrast to this was the Curtiss ice-passenger "Sea" biplane intended for South American use. Curtiss also had the three-passenger "Crude" and a new seaplane. Aeromarine had the "Flying Lincolnton," and Dayton-Wright the "Aerial Corps." Ordnance Engineering Corporation exhibited the "Grosvenor Transporter," a four-place open biplane with 150-hp Hispano-Suiza engine. West Virginia Aircraft Corporation was represented by an open three-seater, using the same engine.

The Flight Regiment Armory, in which the show was held, was especially decorated with a series of psalms, large panels showing the history of state-African and continental travel. Above paintings were mounted in the newspapers daily, and the latter were referred to for extensive review of the exhibits after the opening.

Currently enough, there were no armed machines shown, nor even any built for machine guns. None of the planes were either piston or biplane type. Wright's Co. had the largest exhibit, which included the original 1903 Wright Flyer side by side with a new Wright two-place reconnaissance tractor and the Wright

but there were no further losses, and apparently public interest lagged far behind the enthusiasm of the sponsors.

There was one another exhibition in New York in 1929, when the New York Aviation Show was inaugurated by Aviators' Post 743 of the American Legion between Feb. 6 and 13, nearly 200,000 people paid admission to the Grand Central Palace. Sales of over a million dollars' worth of aircraft and engines were reported—largely to dealers and distributors. However, the show paid expenses and made a profit for its promoters, and is to be considered a decided success. On the other hand, due to the fact that the exhibition was not sanctioned by the Aeronautical Chamber of Commerce, very few important manufacturers exhibited planes or engines under their own names. Most of the entries were shown by distributors and dealers or operators.

Columbia Air Lines, Inc., headed by Charles Levine, cosponsored the feature exhibit, consisting of three planes. None of them had been extensively tested, and they now seem to have disappeared, either from lack of development or of public appreciation, so their interest must be entirely faded. The Triad, a high-wing monoplane with a Whetstone engine, had a detachable fuselage so that it could be flown as a land plane, flying low, or amphibious, as desired. There were also an "Uncle Sam" mail plane with an inverted radial engine, and a small single-engine sport plane with a 200-hp. Stinson engine. Finally, the firm showed a 280-hp. Farman engine, plans for production of which were announced.

As a matter of fact, a number of special features attracted rather more attention than the aircraft exhibits themselves. Particularly was enthusiasm aroused for the Ragdoll Oratorator, which gave attended visitors a chance to experience all the sensations of flying (or some of them, perhaps) without the inconvenience of leaving the ground. And one in attendance who probably saw the back of the well-known aviator's shield went, provided care by Lady Jane Mary Heath and Miss Augusta Barham. Otherwise, there were rather too many irrelevant exhibits, such as Boy Scout equipment, motorcycles, etc., while the display planes had very much to show by the figures and numbers of thousands of spectators in the hands of demonstrators and purchasers.

Altogether, 32 planes were shown by regular exhibitors, and six by the National Guard and other organizations. There were two engines, and 117 of accessories, spare parts, and other things. Among the other new planes were the Cessna's eight-cylinder Whetstone-powered monoplanes, built under the direction of Clarence Chamberlin; the Hill Birds Aircraft Corporation flying boat biplane; and the Arden sport biplane. Exhibits of planes already well-known included Bellanca CH, Beechcraft Aeromobile Corporation's "Kitty Hawk" (B-1), Bell "Speed Airplane", Voight Condor, Hamilton monoplane, Aeromarine Kleaner, New Standard, Siskely "Flying Dutchman", Stevens Monarch, Moth; Army Aviator, Curtiss Robin; Alexander Eagleman; Seashell; Ryan Brewster; Caspary-Alex, Travel Air; Cessna, Sperry, Monosop; Stearns, Advance, Laird; Stearns Jr.; Aero-Astral; Captain Frank Hawks himself was present with his record-breaking Lockheed Air Express. Engines were less well represented, but entries included Kleaner, Curtiss Eagleman, Ryan-Turner and Niagara-Siskely and the Belgian Sisco.

Feb. 7-13, 1930, the promoters repeated the performance, in the same location, since they liked to receive official sanction, a smaller number of the large monoplanes were represented. The attendance fell off by about 25,000, and fewer sales were reported. Nevertheless, the show was financially successful, and offered exhibits of very considerable interest and variety, even if they were not completely representative of the industry. Once again, there were rather too many motorcycles, vacuum cleaners, and gadget, while the air continued to be full of models and gliders. Authorities at the Grand Central station have forbidden the throwing of rice at wedding parties there, and it is doubtful if the show is more by order to lose the sight of an eye last year, and it will be extraordinary good fortune if a similar accident does not result from the reprehensible flying of toy planes at crowded shows. Since the show was "successful," it was perhaps inevitable that it should include a great many models of multi-engines, amphibious liners, and other manufactures which were awkward to make one shoulder, even in their miniature form.

Other special features, however, were exhibited. A small showing of a continuous run of moving pictures of Naval ship maneuvers, and the contemporary New York Times display showing famous flights, received well-deserved attention; so did two miniature airport displays to show lighting equipment. One of these, a model of the Detroit Grosse Ile airport, was particularly effective.

Seven planes were exhibited for the first time. Outstanding among these, merely by its size, was the twenty-passenger Harbord transport with its two Wright Typhoon engines. The Upson-Barnett Company also showed the small two-engine plane designed for the Guggenheim Safety Aircraft Contest. There were three Aeromarine Kleaners, as well as the Kleaner-Dangler plane which was flown around the world by Ilmorog from Knappton Wharfedale. Among the others which made their debut were the Curtiss all-metal monoplanes, Leavitt's "Aviator" flying boat, Get Bee big wide-body lighter, Airspeed's low-wing racer, and Twentieth Century low-wing monoplane.

Engines were not scarce then as they had been the preceding year, though Fiat had interesting shows of its two radial engines. Passenger planes to be seen included Aeromarine, Bellanca, Badgerok Bullet, Whetstone Swan, New Standard, Travel Air, Argus, and Standard. A number of gliders, highly built to German designs, were shown by American, Matthews Aviation Corporation, American Skyplane Company, and American Engineering School. The Coddle Company contributed the SE-5 and Fokker D-VII, two planes which had been used in the flying of "Hells Angels."

Commenting on the New York shows as a whole, it would seem that with new cooperation they had experienced entertainment at the expense of commercial enterprise and the execution—in 1929, in the manner of any of them to follow. Now, however, the dark period is over.

The public is interested and with the aid of a reasonably good publicity staff, an aviation show in New York City can certainly be made to pay expenses, even without the help of contractors or unwelcome exhibits. The problem, then, is to make the shows profitable to legitimate exhibitors as well as to the promoters. This will be seriously attempted for the first time at the forthcoming Sisco, and so it is hoped that a worthy precedent will be established.

THE N. Y. Show IN PROSPECT

*Exposition at Madison Square Garden, May 3 to 11,
Promises to be the Largest Ever Held in the East*

By LESLIE E. NEVILLE

Principal Editor of Aviation

THE NEW YORK Aeronaut Salon, which opens May 3rd at Madison Square Garden, under the auspices of the Aeronautical Chamber of Commerce, will be the means of bringing to the metropolis for the first time a number of the feature exhibits of the recent middle western exposures. Despite the short period of time that has elapsed since the All-American Aeronaut Salon in Detroit, there will be several new airplane designs and the exposition itself will probably be the largest ever held in the East. While the underlying theme of the display is to be an insurance, there will be a great mass exhibit of airplanes not eventually in the transport field and it is expected that about 80 airplanes are to be exhibited, including those of sport and training types. A large selection of aircraft power plants and accessories also will be on display. The show is being managed by Clifford W. Henderson.

In order to accommodate the six of the largest transport planes a section of Madison Square Garden has been rebuilt. Entrance ways have been laid out, seating arrangements changed and progressions made largely, mainly to accommodate these planes, particularly the Fokker F-32 which drew so much attention at the recent Detroit Show as the largest American commercial land plane. In striving to meet in the new Fokker plane will be shown the "Aeromarine" development of the Aeromarine Corp. of America, which has attracted attention at both the Detroit and St. Louis Shows. The Aeromarine is one of the smallest engine-driven planes at present available on the American market.

The exhibit is to be divided into two general classes, the first to include the transport planes and the second the sport and training group, including the new amphibians that have become popular recently. The transport display will be in the main arena, while the sport exhibit will be held to house the lighter craft. Both exhibition floors and a balcony which is to be constructed in the arena will be lined with engine and accessory booths. Two to the square feet of exhibition space is expected with some of the western exhibitors the Chamber here at tempted to limit each exhibitor to a single model, which would serve to make the New York Salon an accurate cross section of the industry. Present indications are that this will be a bold assumption 130 exhibitors

beside the Fokker F-32 the air transport exhibit will include the Consolidated Commodore, a 27-engine Ford monoplaner, a six-engine Sikorsky amphibian and a two-engine Stearns Monarch 3-55 flying boat and the Curtiss Condor transport. Most of these airplanes have been described in detail in previous issues of Aviation and all of the others are scheduled for early description. Airplanes the higher class are to include the Boeing NB-3, Stearns, Siskely Flying Dutchman, Voight Condor, Harbord Amphibian, Travel-Air, Great Lakes Trainer, Ford-Hill West, Gray North Arrow, Bellanca, Pratt, Eagle Rock, Bell, Monosop and many other planes. A touring fighter fully equipped with guns will represent the military type and the prize winning Curtiss Tanager also will be shown. The record breaking Lockheed Sirius and by Col and Mrs. Lindbergh in their transatlantic flight is another feature.

Powerful for decorative effects and partly because of space limitation several airplanes will be suspended from the ceiling of the Garden.

In addition to the airplane, engine and accessory exhibits during the week of May 3-10 there will be a goodly number of non-aerial and engineering exhibits for those directly associated with the aircraft industry and speed features in the form of flights and demonstrations for the spectators in the show. One of the outstanding points in the program is to be a exhibition headed by Lieutenant-General Walter T. Brown and his band of air mail pilots throughout the country. This event is scheduled for May 5th and more than 100 veteran flyers have accepted nomination to take part in the program.

The first public showing of actual photographs taken on the recent flight of Commander Richard E. Byrd over the North Pole will be a part of the Byrd exhibit sponsored by the New York Times.

Another one of the features of the exhibition is to be International Day, May 21st, during which practically every nation in the world will be represented through some member of its diplomatic corps or some famous flyer or aeronautical leader, and some attempt will be made to summarize and compare the progress made in each of the aviation specialties.

Technical position relating to the general theme of air

James J. Smith, Engineer Co., Box 111,
Gen. Garfield, Calif., represents the E. A.
Fisher Co.

[illegible]

A. H. Easke
Jens Riedel und Freunde Herberger, 1 rue
d'Orléans Paris 16, France.
E. M. Elmer Co., 409 St. E 2nd Ave.,
Minneapolis, N. Y.
Theodore JEFFERSON, c/o Georgetown Station

Deurbolia, 20th
Green Lake Airways Corp. 444 Ford

Present address: 410, 19th Ave. N., E. 650,
Minneapolis, Minn. 55412, U.S.A.

Wyman-Doonan Co., Worcester, Mass.
represented by R. E. Robinson

Story of the First
4 P. M.—Rural
Pilot at National
Fire Booth

May 4, 1964
12 Noon—Ship

doors open	Trans-	11 P M -8
doors open	Trans-	8 45 P
doors open	Trans-	8 30 P M

Address: Ruth Elder
Address: Blanche

TENTATIVE PROGRAM FOR THE
New York Show

✓

Map 2, Intelligent Map

1000

12. **Notes**—Show doors open. Drain-

11. $P(2) = 50$ hours (hours).

May 11, Army and Navy Secs

May 18, American Youth Day

Step 14: Women Find a Way

May 4, Transportation Day

12 News—Show doors open. Train-

State Control OF AVIATION

A Review of the Task of Building up the First Department and How it has Brought Air Regulation

An Interview With
CAPT. CLARENCE M. KNOX
Connecticut Aviation Commissioner

By A. R. SANDS

THE plan of state control of aviation now in operation in Connecticut, has been a number of years in reaching its present state of development. As far back as 1911, Connecticut attempted to get control by licensing pilots and aircraft, under the Secretary of State. [Thereby becoming the first state to make the attempt—Ed.] Ten years later prohibition was given to the Motor Vehicle Commissioner. That directly overhauled official realized that there would be almost need of a comprehensive regulatory aviation program and, as an interim step, appointed a group of civilians of whom I was one, as aviation inspectors for the Motor Vehicle Department. We gave practically all of our time, for a number of years, to our desire to see the state become air minded. An air meet in 1922, bringing with it many previously unconnected problems of regulations, and a considerable accident at New Britain where thousands of lives were endangered by reckless flying over the Yale Bowl accentuated the present administration of measures sufficiently potent to prevent further occurrences of the same sort and were the necessary to legislative action. In 1923 future planning and some one paid inspector was secured. In 1924 office space was assigned for state aviation work and in 1927 a separate department was created by act of the Legislature and I was placed in charge.



Inspector John Stern and Captain Governor. Inspect, Connecticut in the state plane

In the meantime the city of Hartford was in itself becoming air-minded and the activities of the state officials noted by Hartford residents who were anxious to see the city take a recognized place in aviation had culminated in the acquisition of land to the south of the city, already owned by the municipality, and their development as an airport. Under our direction, over 8000 trees had been removed, land filled and proper drainage installed. An Aero Squadron was organized. Hartsford Field accepted as a recognized airport and flying facilities were then made available consistently with the assumption by the state of jurisdiction over aeronautical affairs.

THE WAR left us with an accumulation of machines, built in an early experimental period and for war work. For the most part they were unready and obsolete, from the very purpose of their construction and it has taken years to get rid of them. The men who were then were trained in war and as tactics. To the great majority of them flying meant war and all that went with war and they wanted to get out of it. We had a great glided with machines and short of them. Then came the

IN CONNECTICUT

State Aeronautics About



Inspector Stern and Captain Governor. Inspect, Connecticut in the state plane

after-war group—men who carried on the development of new types of machines who have experienced in the commercial use of planes and development of airports and who have just begun to look the development of the private plane for the private use.

"After them, what? We have thousands of a younger generation, boys who are looking to the fallacy of our old theories that youth has no place in the technical field. Radio development proved how wrong we were and the

To my way of thinking, however, we can at least have an ill-balanced program if we are to overlook that great and important element in consideration—the public. I do not believe in governmental interference with private enterprise, but I do not believe either, that there is any one who can question the need of preventing the employment of improper personnel and equipment in aviation.

"Who then can best do the regulating? I am very definitely of the opinion that there is a job for the state-politician, a job for the statesman, a job for the Federal Government. What the Federal Government is doing now is admirable so far as it goes, and we are bending every effort to support it and to harmonize our laws with theirs so far as compatible with circumstances surrounding safety control in the state. The Federal Government cannot, however, through sheer lack of man power and vast expense of territory, do what a state can do in some very important laws and it is of course essential to control of aviation traffic.



Headquarters of the Aeronautics Department in Hartford

bestmen—the way in which these boys of to-day are studying aviation in all its aspects, from gliders to the most complicated plane, must make us realize, if we are not already blind, that it will not be more than a very few years before aviation will be given a tremendous impetus. Are we then to be faced with the having thrown away our day of preparation? Can we sit by and let a situation develop that will cause far more drastic and certainly less intelligent regulation, because hurried and unthoughtful, when we have the remedy in our own hands now? The organization is necessary—let it come now.

The whole emphasis, through this country so far, has been put upon regulation of plane and pilot and positive devices for them, all of course absolutely necessary.

the state of government might be governed to about its divisions. In the first case those providing for the appointment of a Commissioner of Aeronautics to hold office for five years, who shall enforce the statutes concerning aeronautics, report annually to the Governor, appoint assistants, and may myself or after the said statute provisions of the aeronautical laws as he finds necessary or desirable. An Advisory Board on Aeronautics of seven members, to serve four years each, without reappointment is also created.

Registration of resident pilots is compulsory in Connecticut and a number is assigned only after the aircraft is inspected and passed for safety requirements. The fee is \$25 for a full year, \$15 after June 30. Harbinger-

Alaskan Airways MAKE RAPID PROGRESS

Development Thus Far Has Speeded Up Travel in the Interior and

By KENDALL K. HOYT

AFTER half a century of slow ground methods Alaska is speeding advancement by speeding from the air. Not only are flight explorations hastening the development of pipelines, minerals, and other resources from a remote possibility to a fact. For distant feet, but a network of airways has sprung up to serve the settled regions on a sound commercial basis. Forty-one landing fields already have been constructed in addition to those supplied by nature and more are in progress. Air taxis are available at the principal towns for freight, mail, and passenger service to all points in the territory.

What this means to living scattered communities with each other and with the outside world may be appreciated from the fact that the airways spread of Alaska is as great as that of the United States and the land area one-fifth as great. This vast domain is populated by only 30,000 whites and so many natives. Land transport in the country is limited to the railroad and highway system which connects the larger towns and settlements in central Alaska. In the winter when the northern ports are icebound and the roads are snowed under, the well known dog sleds running over the frozen rivers, along the highways, or on specially constructed trails

This whole is based on the observation of E. W. Sawyer, executive assistant to Secretary of the Interior William and on the comment of other Washington officials dealing with Alaskan development. Mr. Sawyer recently returned from an extensive tour of Alaska for his Department, 2000 miles of which was by air routes

were the only means of travel prior to the introduction of airplanes.

The distances are now spanned by planes on a year round schedule, landing on gravel pits in the summer months or on runways during the snow period. Airships have been found particularly useful. After the spring thaw when rail lines are a series of swamps

Has Benefited Industry in General

and pools, infected with countless flies and mosquitoes, other means of travel would be impossible. Numerous labor fourth good summer landings along the coast. Beaching facilities have been provided at several of the airports.

A comprehensive program of air field construction is being handled mainly by the Alaskan Road Commission under its president, Maj. Malcolm Elliott of the Corps of Engineers, working with cooperative funds advanced by the Federal Government, the Territory of Alaska, and local communities. In addition to the regular work of clearing, grading, and removal of landfills, the Commission supervises the erection of shelter sheds and telephone lines to the airports. These airways are regarded by the government as a regular part of the transport system.

When a through highway from Seattle to Fairbanks being considered in the next logical step in Alaskan development by both the United States and Alaskan governments, the use of airplanes takes on a new significance. Already more than half the distance has been covered by mail and present negotiations give reason to believe that the last leg will be closed within the next few years. But such a road will be laced by more air routes out of the year leaving an unbroken route which, for long jumps, doubtless will be flown during this period. Aside from the obvious saving in time, or transport may be in many instances cheaper than other methods even for bulky heavy commodities. Under extreme conditions in the past, haulage charges have run as high as \$50 per ton-mile, a heavy burden on interior producers. It is said that the highway system already has paid for itself several times over, saving at a price \$2,000,000 per year. There is no doubt that, particularly to the remote capital, the airways are so sound an economic basis. Commercial firms seem to think so as shown by the recent merger of Alaskan lines.

It is not possible to estimate the value of airplanes, parts, and accessories which have come into Alaskan use because the Commerce Department figures are well broken down to show these items and because there is



Alaska: The field at Fairbanks, Alaska, is the oldest of 1935. Below: An Alaskan airfield. —Left to right: Maj. Malcolm Elliott, Alaskan Sawyer and Phil Bennett.

significantly, so several of planes which have been flown into the territory in Russia. Using Commerce statistics in which planes and parts are of principal value, though some other things are included the rate of growth in exports from the United States to Alaska may be shown by these figures: in 1928, \$80,000 for 1928, \$1,160,000 for 1929, and \$1,710,000 for 1930. Though not yet large compared with domestic output, these must be a good showing for an infant enterprise and promise a profitable business for American firms in years to come.

So far the main use of planes in Alaska has been for interior flights rather than for outside connections. However, with pioneer flights in those of Capt. Ross G. Hoyt last summer indicate the feasibility of a regular service to connect the suburbs of the United States with those of Alaska. The problem now is one of airworthiness because landing facilities are not of the best. With a series of fields provided in the British Columbia and Yukon areas east of the coast range, such as Hazelton, Alton, Klondike Lake, etc., and at numerous points inland, it would be possible to get into Alaska or Fairbanks in safe and easy stages where all Alaskan fields are readily accessible.

The Pacific coast route is better though not so a regular schedule, planes have gone back and forth without mishap. From Los Angeles to Seattle is not a difficult two-day flight with a stopover at Seattle. Landing fields on the coast of British Columbia and in the



Four of the planes operating about the field at Nome, Alaska. Photograph taken June 31, 1935.

Alaskan peninsula would be a seasonal and not air projected.

One of the difficulties of Alaskan flying is the rapidly changing weather and the preponderance of rain and fog during the spring and summer. As an aid to aviation, up-to-the-minute weather information is telephoned to most of the fields from the Signal Corps radio stations which are set up at all important points. A weather bureau station has recently been established at Fairbanks to further this purpose.

It is believed that within a comparatively few years Alaska will be an important link in an established air route from the United States to the Orient. Advancing industrial conditions in Japan and Manchuria will demand it. The difficulties are less than at the cost of transatlantic flying because the Oriental route would be mostly over or near land. A great circle of the earth describing the shortest distance between New York and Tokyo passes a little north of Fairbanks and Nome, showing their strategic position in future air transport. Aside from the non-commercial flights which prove the possibility of such a route, one enterprising pilot recently went into Siberia and flew back to Alaska with a small fuselage biplane. It is conceivable that there will be mean when the wing of a work in the shipment of oil or other de luxe commodities from Japan angle make the added cost of air transport worth while to American concerns.

Returning again to the direct effect of aviation on Alaskan development, outstanding service has been rendered by the Navy planes which set out on a second expedition last summer to map large areas by air methods for the U. S. Geological Survey. (NATURAL, Dec. 21, 1925.) Four Army aviators accompanied by the regular Geologists and a large to home the photography and machine equipment and the technical personnel have been mapping some of the larger islands and three regions near Japan. The Geological Survey working in the interior has sent its parties on during the

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An example of men mapping during the winter months in Alaska.

past two years, thus lengthening the field season by a matter of weeks. I remember the slow progress of pack routes in the past when, among men in conditions but less so slow that the men had to come out again to avoid the incoming winter almost before they had fairly begun.

At a conservative estimate, air mapping is said to have cut about the utilization of spot mineral, polymers, and power reserves by at least several years. Large areas of Alaska are still unexplored as illustrated by an accident on E. F. Snider's recent trip. Forced off course by fog, he discovered in a region hitherto supposed to be barren a tract of 4,000,000 acres which will be excellent for regular grazing, logging, or more, to be spoken, when driving the animals overland.

SEVERAL FACTORS COME INTO ALASKA. It may be said that such enterprises which have been developing there against extremely adverse conditions have passed the experimental stages and are beginning to get on stage to have a nucleus for further expansion when it becomes convenient to exploit Alaskan resources on a larger scale. Though nothing is known in reality a sudden boom, it is evident that Alaskan industries are gaining a little bit each year and actually are compensating about industrial depression. The outlook for Alaskan resources would therefore appear promising not only as a pioneer effort but as an established steadily increasing business.

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Capital Investment IN THE INDUSTRY

A Particularly Interesting Analysis of How Capital has Been Invested in Aeronautics and for What Purposes it has Been Expended

By ROBERT R. DOANE

THE EXACT determination of the total investment in an industry at any given time is a difficult undertaking. It is difficult for many reasons. First non-uniformity in methods of accounting presents a problem; second, the fact that all corporations do not issue public statements in any form; and third, if all statements were available and a uniform method of accounting were adopted there would still remain large differences of opinion as to those items that should be

included in the estimate, as we have witnessed in the case of our railroad valuation problem.

However the necessity of being specific in a clear definition of exactly what it is we are setting out to find.

The total capital funds invested in an industry, the total capital funds employed by an industry, and the total capital represented as indirectly a part of an industry are all different things, and supply us with different totals. That there is at the outset a certain amount of confusion as to exactly what is meant by "total investment" as well as to what value it would be to us if we had agreed upon a definition and knew the exact amount.

In taking up the latter problem first it can be said that the advantage of using things which it is difficult as to certainly not used a complex, non-uniform here of the arguments is its defense. Suffice it to say that the problem of unbalanced production alone justifies our accurate knowledge of the resources in an industry's demand. Further such knowledge may serve to supply us with a set of standards or tests with which we know of the economical industry may be compared to another as well as a measure of managerial efficiency.



Chart 1 - The various investment dollar



An airplane's landing field on a new line of the Alaskan Railway.

and individual corporate progress

The capital of an individual consists of its individual corporate assets. List of holdings, however, are not included in individual corporate assets—cash, accounts receivable, patents and all other forms of property owned by an individual participant in corporate partnership or otherwise, contribute to capital assets.

Since many of the assets of a concern are fluctuating more or less continually, a value they are likely to be north at any given time more or less than their original value. Therefore a proper method to measure the total capital invested in the industry is by the number of shares outstanding since current market quotations.

A less accurate but more concrete and useful method refers to capital investment as the total amount received from the sale of the corporate securities. This method eliminates the investment of new capital out of the profits of the business (surplus) and makes no provision for division between investment funds, holding companies, merger stock sales, etc. Further, and of prime importance, the ultimate elimination of purely stock transactions, noted which any industry is valued, cannot be readily accounted for.

Then there is the first economic dimension of capital—not as funds—but as goods and services employed plus the present value added to the future market return in the account. This method quite naturally gives a much larger value than any of the above-mentioned methods, as it must include the value of all plant, parts and engines made in any year as well as the value of the total number of planes already in use in the industry.

And last—the actual investment in an industry—for all individual corporate assets of its capital—includes which are corporate ownership share—equity surplus. Thus, literally, capital investment refers to the total original cost of the assets of the various concerns plus what they have been able to save out of their operations.

It is this latter method that we have employed in this

Table 11—Corporate Total Capital Employed in the Aircraft Industry
(Overseas included May 1, 1938-1938)

Item	1932	1934	1935	1936	1937	1938
Investment in Domestic	1,000,000	400,000,000	400,000,000	400,000,000	400,000,000	400,000,000
Investment in Foreign	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
Total Capital Investment	2,000,000	401,000,000	401,000,000	401,000,000	401,000,000	401,000,000
Assets	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Domestic)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Foreign)	0	0	0	0	0	0
Assets (Total)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Domestic)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Foreign)	0	0	0	0	0	0
Assets (Total)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Domestic)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Foreign)	0	0	0	0	0	0
Assets (Total)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Domestic)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Foreign)	0	0	0	0	0	0
Assets (Total)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Domestic)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Foreign)	0	0	0	0	0	0
Assets (Total)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Domestic)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Foreign)	0	0	0	0	0	0
Assets (Total)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Domestic)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Foreign)	0	0	0	0	0	0
Assets (Total)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Domestic)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Foreign)	0	0	0	0	0	0
Assets (Total)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Domestic)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Foreign)	0	0	0	0	0	0
Assets (Total)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Domestic)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Foreign)	0	0	0	0	0	0
Assets (Total)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Domestic)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Foreign)	0	0	0	0	0	0
Assets (Total)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Domestic)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Foreign)	0	0	0	0	0	0
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Assets (Foreign)	0	0	0	0	0	0
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Assets (Domestic)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Foreign)	0	0	0	0	0	0
Assets (Total)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Domestic)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Foreign)	0	0	0	0	0	0
Assets (Total)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Domestic)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Foreign)	0	0	0	0	0	0
Assets (Total)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
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Assets (Foreign)	0	0	0	0	0	0
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Assets (Foreign)	0	0	0	0	0	0
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Assets (Domestic)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Foreign)	0	0	0	0	0	0
Assets (Total)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Domestic)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Foreign)	0	0	0	0	0	0
Assets (Total)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Domestic)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Foreign)	0	0	0	0	0	0
Assets (Total)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Domestic)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Foreign)	0	0	0	0	0	0
Assets (Total)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Domestic)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Foreign)	0	0	0	0	0	0
Assets (Total)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Domestic)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Foreign)	0	0	0	0	0	0
Assets (Total)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Domestic)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Foreign)	0	0	0	0	0	0
Assets (Total)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Domestic)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Foreign)	0	0	0	0	0	0
Assets (Total)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26,000,000
Assets (Domestic)	2,000,000	7,000,000	14,000,000	18,000,000	22,000,000	26

a deferred asset but also appear on the liability side as a capital charge. Also the treatment here of issue reserves is controversial in large part in which which it will hold for a while and later distribute. Such deferrals, figured at 3 per cent, certainly a conservative figure, would account for another 33.7 millions. Further there is that amount of the following losses or evidence has been reported to re-invested as well as the underwritten single will lying undistributed in the dealer's offices; a total amount while estimated at 10 per cent of the total which never reached the ultimate investor. The total sum of these various deferrals amounts to the considerable portion in excess of 280 million which may be subtracted. Of course this is a continuous process with new securities coming on to the market, over the period of twenty-four months under examination, which are in turn (in positive of them) traded out for the previously partially distributed securities. On the whole it may be safely estimated that out of the total number of new offerings that just absorbed by the investing public does not stand at much more than 400 million dollars.

When it is realized that during this same twenty-four month period the American investing public absorbed over thirty and one half billion dollars in new corporate securities of railroads, public utilities and industrials, imported another two billion dollars in foreign securities, produced five billion dollars in new building and real estate ventures and employed some seventeen billion dollars in stock market speculation, that portion which went into aviation was in reality infinitesimally small. In other words, out of every dollar invested during this period just a fraction over one cent went into aviation. And yet the balance sheet of the industry today shows that they have consumed of some four hundred and two millions of dollars in assets. For this reason it does not appear that aviation as one young industry, must monopolize.

According to the 1929 balance sheet the total assets of the industry aggregates \$419,241,429. There are

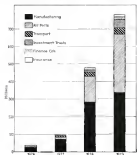


FIGURE 8—Accumulative growth of aircraft industry

1,105,884 shares of preferred stock and 42,349,500 common shares outstanding. The total surplus stands at \$29,651,008. Thus there is represented a total capital investment in the industry of \$371,249,430.

The assets are distributed (see Chart 1) according to the following percentages:

Assets	Per Cent
Investment in plant, machinery and related assets	38
Other investments	10
Cash	11
Receivables	1
Accounts receivable	2
Prepaid accounts	1
Payable accounts	1
Stock placed with customers for expenses	11
	100

Current assets thus are as follows:

	Per Cent	Per Cent
	Total	Assets
Cash	15	18.7
Investment	2	2.5
Accounts receivable	2	2.5
	19	23.7

Current assets per share, of common stock thus amount to 40 per cent of \$419,249,429, or an average amount of \$47.88 per share. With the per common share value of about standing at 30 per cent and investments at 10 per cent the theoretical book value stands as follows:

	Per Cent
Current assets	\$209,624,714.50
Investment	\$41,924,942.90
Accounts receivable	\$41,924,942.90
	\$419,474,600.30
Total current liabilities	\$15,159,530
Net available assets	\$394,315,069.80

Thus it can be readily seen that on Dec. 31, 1929, each aviation securities holder at a market valuation of \$62 million they now "own" at exactly their book value and not discounting from, earning power.

Showing now a general idea of the bookkeeping position of the industry the next question might well be asked: "What is the probable future value of this investment?"

When put on this basis such comparisons must even today have no point unless relating to individual corporations. Here again, the extremely meager information thus disclosed by many of the corporations offers only very general grounds for analysis. However, a fairly accurate approximation of the total annual gross return may be obtained, which although it cannot be very helpful in answering the above question may serve as well as a measure of the adequacy or inadequacy of the industry's total organization. These ratios are clearly indicated in the accompanying Table No. III. The total gross value of business does not include minor revenues from small operating companies, local time service companies, etc.

One of the important standards or tests of efficiency in all lines of business is the percentage of total expense of running the business to gross sales. This is what is commonly known as the "operating ratio." The difference between gross revenue (100 per cent) and the operating ratio is the percentage of gross profit on the sales. The higher the operating ratio the lower will be the percentage of gross profit—a high operating ratio may mean that a slight variation in expense would prove

valuable to transform a profit into a loss. On the other hand a low operating ratio—indicative of a business with substantial profits—is therefore subject to considerable competition.

It will be noticed in Table III that both the transport and manufacturing divisions of aviation show a generally very low operating ratio as compared with other branches of industry. A fact which is of outstanding significance to all those interested in the industry at this time. It should be noted that this ratio has been obtained by averaging the gross sales and operating expenditures of only the leading corporations in the industry and does not include the smaller and even more independent units. This must not be taken as a selection for its better ability to demonstrate business possibilities.

Another interesting and enlightening comparison in the table will be found in the low percentage of gross return to total expenditures. This would indicate, on the basis of this showing for aviation, a clear over-capitalization. When we consider the small and highly favorable operating ratio compared to the rather low ratio of gross to expenditures it becomes clear that the business is a profitable one but that the profits have had to be equalized too soon. However, this does not take into account the financial management plans for the ultimate expansion and growth in total volume of business.

It is thus conceivable from this analysis that the large increase in output of late years coupled with the so-called unbalanced production of last year has not been warranted by the expense of the industry's production for the future.

The present plant equipment of the industry now estimated during 1928 and early 1929 is a producing capacity of what has been estimated at 20,000 planes per year. This is a rapid rate of expansion would be equal only if an excessive demand existed, given without saving. In early 1929 production for the year's output ranged from 12,000 to 19,000 planes, whereas the second year of production would not help but hasten the total consumption of planes to a figure around 40,000 for the year. Thus these economies of over-expansion have proven so many costly to the industry that the present condition of its balance sheet now discloses quickly as well as its management's ability to effect a rapid readjustment.

That portion of the entire sum of money now placed at the disposal of the aviation industry which is invested in new materials in stocks partly finished and in finished products and in accounts receivable now stands at a value less than 18 per cent of its total costs.

By adding to the above-named items the total marketable securities held by the Government bonds and cash we get the working capital of the industry as distinct from its fixed capital. This sum now stands at approximately \$220,000,000; almost two-thirds of the entire investment in the industry. The volunteming from

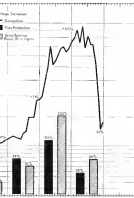


FIGURE 9—Market behavior of aircraft stocks

this amount the total current liabilities were standing at around \$25,000,000; or just \$23,000,000 as the total aggregate net working capital of the industry. A sum in excess of 50 per cent of the entire investment in the industry which is represented in a liquid state, with an average ratio of current assets to current liabilities of

	Observed in December (per value)	Estimated 1930 (per value)	Current	Total Assets
Class A, (per value)	3,000,000	3,000,000	3,000,000	3,000,000
Common (per value)	30,000,000	30,000,000	30,000,000	30,000,000
Total	3,000,000	33,000,000	33,000,000	33,000,000

TABLE 11—Aircraft Corporation—Major Securities are Actively Traded in the New York Market

Stocks	PER	1929	1928	1927	1926	1925
New York Stock Exchange	1	1	1	1	1	1
New York Curb Exchange	1	1	1	1	1	1
New York	1	1	1	1	1	1
Open Market	1	1	1	1	1	1
Total	1	1	1	1	1	1

TABLE 12—Average Annual Rate of Return Per Share Since

Total New Aviation Capital Issued (per Cent)	94
Current Investment (Manufacturing and Transport) (per Cent)	94
Since 1913 (per Cent)	94

10 to 1. Certainly a comfortable and more than adequate working capital position.

The per cent of current liabilities to current assets of current assets to total assets, and of current liabilities to total liabilities, follow:

Current Liabilities to Current Assets	Current Assets to Total Assets	Current Liabilities to Total Liabilities
100%	100%	100%

It there have been many instances of over-liquidation in the extension of demand it has not in any really severe reflected itself as weakening the working capital position of the industry.

A full use of principles as to the proper proportion of working capital employed in the aircraft industry cannot be undertaken within the limits of this article. However, it may be stated that it would be clear that the proportion of working capital among the transport operating companies is greater than in that of manufacturing. Also that in manufacturing the cash-making elements naturally involve the volume of business, the length of period of manufacturing, the amount of sale and purchase, seasonal variations, etc. When these factors become more or less satisfied then we can probably say that a 50 per cent increase in output will necessitate a proportionate increase in working capital.

From the foregoing it will be seen that not only from the viewpoint of present plant equipment but from that of working capital as well the industry is entirely capable of supporting a far larger annual turnover before recourse to borrowing or additional financing will be necessary.

In looking upon any industry from an industrial and important point of view we need a perspective in order to see clearly how it fits or can be made to fit into the mosaic of our industrial life. For this purpose Table IV has been included which supplies average comparative earnings ratios for other important industries outside the field of aviation. Also Table V has been included which serves to give perspective in ascertaining the relative asset of capital employed as well as the present relative economic position of the various major industries.

As long as there are changing perspectives within existing facts then must be a continual re-financing of our use to be kept the adjusting elements in clear definition. Especially is this true since large numbers of the public have, through investment, come into partnership with it.

As present the best available method this public has of measuring aviation's advance is through the market behavior of its securities. During seasonal speculative conditions these values fluctuate with earnings. Without the comparative relationships as shown in Chart 5 between changes in percentage increases in output and gross earnings and market price trends. It appears from this study that the real inflation in aviation took place prior to 1929 and that as early as May of last year adjustments of considerable magnitude were under way.

As a result of this review of the industry's resources one thing is outstandingly clear—that aviation's advancement is not being retarded because of lack of funds. Like other industries in the American industrial structure aviation has been able to take advantage of the unprecedented period of capital accumulation of recent years and attract to itself in proportionate share its abundance. So great has been this accumulation that a majority of the major enterprises—outside those being mentioned and transport units—are virtually investment funds as well.

Table III.—Assets to the 5 Major Firms	
Total assets (including all securities)	\$62,352,000.00
Current and other holdings	\$1,100,000.00
Other assets, stocks and bonds	\$61,252,000.00
Other assets and cash	\$1,000,000.00
Total 5 Major Firms Assets	\$62,352,000.00
Manufacturing machinery and tools	\$1,300,000.00
Other machinery	\$100,000.00
Patents, copyrights	\$5,000,000.00
Prepaid expenses	\$10,000.00
Total Manufacturing and Intellectual	\$6,410,000.00
Fixed Assets	\$1,300,000.00
Plant, buildings	\$1,000,000.00
Plant equipment	\$300,000.00
Land etc.	\$100,000.00
Total Fixed Assets	\$1,300,000.00
Current Assets	\$59,042,000.00
Other assets	\$1,000,000.00
Total Current Assets	\$60,042,000.00
Total Assets	\$61,342,000.00
Other assets	\$1,000,000.00
Plant, buildings	\$1,000,000.00
Plant equipment	\$300,000.00
Land etc.	\$100,000.00
Total Fixed Assets	\$1,300,000.00
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Land etc.	\$100,000

ment should be organized as a separate, self-contained unit responsible only to the management of the factory. This type of organization has been established, in spite of the necessary close alliance of inspectors with the engineering department in order to insure responsible and unbiased evaluations of products.

THE INSPECTION STAFF includes 30 highly trained men, who are responsible for the conduct of inspection in every department of the production organization of the factory. John Wilcox, who has been associated with the company since May, 1917, is chief inspector in charge of all company inspection. The assistant chief inspector is W. J. Truesdell, also with many years of experience in airplane manufacture and inspection.

The responsibility of the inspection department commences with the receipt of raw materials at the factory, and issues only with the final acceptance and shipping of the finished plane. When raw materials are received, they are first subjected to inspection. Generally, this consists of a check for quality, quantity and dimensions against the corresponding purchase order and billings.

If the material is of the type which requires a chemical test for composition or physical tests for strength dependent upon the requirements of the contract for which the material will be used, the inspector places the material under load in the machine, and samples are prepared for testing. Tests are conducted by the test engineer, who, although affiliated with the engineering department, is closely allied with the inspection staff. If the tests are satisfactory, the material is properly color marked, to designate the kind of material, and transferred to the stock room to be stored until it is required for fabrication. To ease the work of the engineering department, the material is reported and returned to the source of supply, with explanation of the cause for the rejection.

Lead is inspected at the source of supply by company inspectors, and produced as their recommendation. Parts produced in the machine shop are routed through the metal inspection booth, where they are accepted or rejected by the inspectors. Parts are inspected for



Head frame forgings undergoing general ultrasonic inspection at the shop by plant



Making a final inspection of a 40-ampere structural component

material, dimensional accuracy and quality of workmanship.

Inspection is conducted with detailed drawings, which are submitted with the corresponding products. The exact type of instruments are used by the inspectors for measuring and other forms of inspection, so provide the possibility of parts deviating even slightly from the dimensional requirements.

STAIN makes are heat-treated in electric furnaces for strength and inspection in this department not only includes examination of finished parts but also regular checking of furnace temperatures to insure correct heat treatment. Test pieces are included with each shipment of parts and under treatment, and these are referred to the test engineer.

In cases where parts are fabricated from flat stock, as in the sheet metal department of the plant, a template and one part are produced and submitted to the inspector for his approval. If correct, the template is accepted and production is started.

In most cases during the fabrication of a part, several operations, necessitating work in various departments of the plant, are required before it is completed. After each individual operation, the part is carefully accepted before it is transferred to the next department. The result of the inspector's examination is indicated on the

shop order, which thus forms a complete record of the acceptance of a part during its fabrication.

In the assembly of structural units, such as the fuselage, wing frames or other members of the airplane, where a jig is employed, the latter is closely checked by inspectors before assembling is commenced. When the jig is approved, the working department assembles the component parts, which have been examined and approved. After the framing is completely assembled and checked, it is placed on a permanent steel alignment jig for a final inspection conducted with precise instruments for dimensional checking.

Such careful methods are carried out in the inspection work in the other production departments of the factory. Drawings of the inspection department are maintained in the receiving store, the machine shop, the sheet metal department, the wing assembly department, the landing and landing gear department, the wood-working department, the hull department, the plating and crimping department, the fabric and dope frame, the sub-assembly department, the final assembly department, the shipping department and the hangar in the testing field.

In the inspection of cloth, for example, the number of threads in the square inch must be exactly checked. When the fabric is applied to the wing frames, fuselages, or tail structures, inspectors must make certain that the weaving conforms to military requirements. Stitches and knots must be checked for correctness and number, as well as for size. During the shaping, stretching, and covering the application of the dope so that the specified number of coats are applied and that the appearance and treatment are correct. Water coloring with a fine squeegee is conducted to insure a smooth surface, and inspectors must insure that the grain appears upon the fabric. Color dope is so effective, preventing moisture against injury to the cloth, for the rubbing is stopped as soon as the color turns to white, or blue.

IN THE CASE of sheet metal or other structural members, such as the landing, the interior of the tube is protected by a coating of oil. Linseed oil is heated to a high temperature and forced into the tubing through a special port. The inspector can check the progress of the oil through the tubing by touch, for the hot oil heats the tubing, and when a part of the structure is cold, the inspector knows that something inside the tube is blocking progress. When the framework is entirely oiled and subsequently cleaned, the parts are sealed and then a red oxide primer is applied and the same treatment is ideal in a large electric oven to be baked. Coats of enamel are then applied and also baked, and the inspector must check the oven temperatures during this process. Once interior work is protected by an interior coating of red oxide primer.

When the parts are completed and accepted by the inspectors, and following the completion of sub-assembly and the subsequent inspection, work is begun on the final assembly of the airplane. The inspection at this de-

partment is extremely detailed. A department inspector and four sub-inspectors are assigned, in conducting the inspection in the final assembly department. Every detail of the plane is checked. When the inspectors are satisfied that the plane fulfills all requirements, a tag is affixed to it signifying that it is completely approved and ready for release to the test field. Inspection does not terminate, however, with the completion of final assembly. Before the airplane is flight tested, the field inspectors of the organization conduct a final detail inspection. Instruments and inspectors are thoroughly tested and every part and every connection is inspected. In single installation inspection alone there is a report including 24 items that must be checked.

THE possibility of any unsatisfactory part coming into the construction of an airplane, a complete system of identification and classification of parts by permanently displayed tags and stamping and

Inspectors checking a wing section after shipment



marking of parts is maintained by the inspection staff. The tags are prepared for numerous parts, rejected parts, parts requiring further work, parts requiring repair work, parts accepted for final shipment and completed plans, as based from the factory. The tags are affixed to unsatisfactory pieces of the parts to prevent any recurrence in their handling.

In the case of a rejected part, it is generally consigned to the scrap room, and it cannot be used in the manufacturing of any plane. Often the inspector is in close touch as to the acceptability of a part, and in such cases it is routed to the storage department where it is stored for possible use or reworking only after it has been examined by the salvage committee. This committee is composed of the Chief Inspector, the Chief Engineer, the Superintendents and one member representing the purchaser.

The company inspection system in the Boeing plant is closely allied to Army and Navy inspection requirements, and Department of Commerce specifications are adhered to also.

Inspector staffs are maintained at any factory where military and naval work is done by both the Army and Navy for the purpose of ensuring the manufacture of military aircraft. Parts for Army and Navy planes must be designed and constructed according to military requirements and specifications. These parts are required to be Army or Navy inspectors for their approval and acceptance only after the company's own inspectors have accepted them.

Pan American Airways System

**Greatest Air Transportation Line in the World—
Linking North America with 83% of
Latin America's Population**

Pan American Airways System was organized for the purpose of connecting North, Central and South America by a reliable, regular and safe transportation system for mail, passengers and express. At the beginning it was realized that, to be of real service in creating good-will among these 27 countries, as well as building up commerce and industry, this system must reach more than merely the airport towns. With that in mind a program was set forth which would aid one great system the groups of aviation, railroad, steamship and government services with the demonstration that both passengers and mail could move on schedule with speed and comfort from New York, Chicago, Denver, St. Louis, Los Angeles, Boston, Washington, etc., to the principal cities in Uruguay, Argentina, Chile, Mexico, Guatemala, Panama, West Indies, northern coast of South America, etc.

In 1927 the first part of the system was opened—Key West-Havana, later extended from Miami to Havana. Havanna found itself connected through the airline with all the principal points in the United States by means of direct rail connections at Miami for passengers and by means of domestic airlines for mail. In 2½ years Pan American Airways extended its system—and thereafter the systems of the United States national and domestic airlines over 15,000 miles of established airways throughout Latin America.

SEVEN DAYS FROM NEW YORK TO BUENOS AIRES

Just a week ago Pan American Airways System, in conjunction with its domestic air mail accounts, inaugurated the seven day air mail schedule from New York and Chicago to Buenos Aires. This schedule has been made possible by speeding up domestic air schedules through the aid of night flights; the establishment of a new and direct route across the Caribbean from Miami to Panama by Pan American Airways (largest scheduled over ocean flight in the world); and by improvement of ground facilities by Pan American Airport System in South America to such an extent that two days are cut off from Panama to Buenos Aires. None of this was done or even contended until one year of operation had shown an efficiency of better than 99 per cent.

A most important fact is that in following the shortest route to Buenos Aires, namely, across the Caribbean, down the west coast of South America and across the Andes to Argentina and Uruguay (which is the route followed by All America Cable, Inc.), more than seventy-five per cent of the South Ameri-

can population is served. With the other Pan American lines through Central America, Mexico, the West Indies and the north coast of South America, more than 83 per cent of the Latin American population is served.

MAIL CONTRACTS AND DEVELOPMENT

The mail service has been made possible under the U. S. Post Office contract whereby mail is carried by the domestic air mail contractor in Miami, Florida, or Brownsville, Texas, where it is delivered to Pan American Airways, Inc. The U. S. Post Office pays Pan American Airways for every mile it flies on mail schedule from the U. S. borders to the farthest points in South America, namely, Buenos Aires and Montevideo, and stream. The United States Foreign air mail contracts require Pan American Airways System to assign a certain amount of space in its planes for the transportation of mails both from the U. S. to foreign countries and from foreign countries to the U. S. All revenues received from foreign governments for movement of mail to the U. S. or its territories are therefore for the account of the United States Post Office Department.

Col. Charles A. Lindbergh, Technical Advisor of Pan American Airways, not only laid out the majority of the air routes but has himself made first scheduled flights on most of the connections over which now regular passenger and mail planes fly in a year better than 4,500,000 miles. The airways have been perfected to the point where at present there are over 74 airports, and 30 radio stations established and operating successfully. Policies have been worked out and established to such a degree that it has been possible to maintain a schedule and operate planes giving a safe, economic, and dependable service. It is the policy that every pilot shall have flown at least 2,000 hours, which is equal to 2½ times around the world, before he is accepted for service. He is then further trained on take-offs, landings, flights, observation of regulations and use of radio for weather and general control.

MORE THAN AN AIR LINE

The Pan American system has arrangements with established coasting transportation companies to that through orders can be purchased at the principal railroad ticket offices. Tourists and business men may travel between any cities in United States to the principal cities in Mexico, West Indies, Central and South America, or reverse.

The result is not merely an air line, but a great transportation system coordinating the long established means of travel with aviation for the development of commerce and better understanding among the peoples of the Western Hemisphere.

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*To all users and prospective users of
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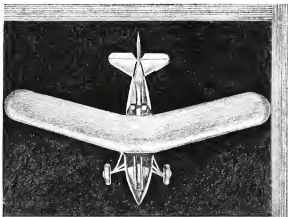
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A view of the Moto Meter gauge, showing the needle and scale, and the wiring connections.



A view of the Moto Meter gauge, showing the needle and scale, and the wiring connections.

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AVIATION May 2, 1939

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17 PARTS

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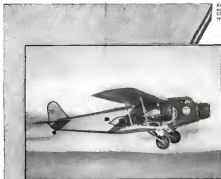
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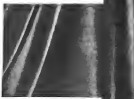
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